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Friday, May 17th, 1895.

The Right Hon. Lord GEORGE HAMILTON, M.P., in the Chair.

ON TORPEDO-BOAT DESTROYERS.

By JOHN I. THORNYCROFT, F.R.S.

The CHAIRMAN: We are met here to-day to hear a lecture from Mr. Thornycroft. It is not necessary for me to introduce Mr. Thornycroft; his name is well known, I think, to every naval officer, not only for his inventive powers, but also for the high finish and excellence of his work. A great alteration has recently taken place in the Navy, and Her Majesty's ships are in future to be largely boilered with water-tube boilers. Mr. Thornycroft has the merit of having been the first to supply these boilers to the Navy. The first vessel so supplied was the "Speedy," and it was the very satisfactory performance of that ship which induced the Admiralty to adopt on a large scale the system of water-tube boilers. I am sure the paper which he is about to read will be useful and instructive, and I hope it will initiate an interesting and beneficial discussion.

LECTURE.

A DESCRIPTION of this new class of vessel, which is so rapidly taking an important place in our Navy, and its essential feature —very high speed—should, I think, give rise to a valuable discussion at this Institution.

The growth of torpedo-boats out of quick launches, and their development and increase in speed, have been described at length on several occasions by my partner, Mr. Donaldson, in this Institution. At his lecture in 1889 he showed very completely how they had developed up to that time, and how we had been able to make an important stride by using the water-tube instead of the locomotive boiler.

This spring, at the Institution of Naval Architects, Mr. Yarrow has shown what can be done by the use of a lighter material of construction; but although aluminium is available for the construction of a second-class boat, its cost makes it prohibitive for vessels of larger size, and it is by building practically a larger torpedo-boat that we have been able to fulfil the requirements of a destroyer.

As long ago as 1885 it was decided to build a class of boat for this purpose, but only of the size and speed of torpedo-boats carrying two

3-pounder Q.F. shell guns, and three double-barrelled Nordenfeldt guns, as an alternative to torpedo tubes, and I believe they were never commissioned as torpedo-boat catchers.

In 1886, catchers of a new type, represented by the "Rattlesnake," Fig. 1, were built. These were 550 tons displacement, and attained a speed of 19 knots. They were armed with one 4-inch gun, and six 3-pounder Q.F. guns, besides torpedo tubes.

It was found necessary to increase the size of the next torpedo-boat catchers, as they were then called, to about 800 tons, and between 1888 and 1890 a considerable number of these vessels were built, and known as the "Sharpshooter" class. The engines were intended to develop the 4,500-I.H.P., which would give them a speed of 21 knots; but difficulties were experienced with the locomotive boilers, and it was found that only about 3,500-I.H.P. could be obtained. In 1892 the "Speedy" with ten others were built, slightly larger than the "Sharpshooters"; and the "Speedy," which my firm built, was fitted with our water-tube boilers, and was able to develop about 1,000-I.H.P. more than the others with locomotive boilers. This fact is worthy of notice, as showing how successful was the first introduction of the new type of boiler into the Navy.

The growth in size of the torpedo gun-boat has been accompanied by greatly-improved seaworthiness, and officers and men can live on board with tolerable comfort; and it will be remembered that the "Gleaner" crossed the Bay of Biscay in a very severe gale last winter, and proved herself an excellent sea boat.

But there has been no corresponding increase in the speed in this class of vessels intended for destroying or catching torpedo-boats, while the speed of the torpedo-boat has rapidly increased; in the last ten boats built for the Admiralty, the speed being over 23 knots, and some giving as much as 25 knots.

It is evident, therefore, that although there may be conditions of weather which will give the torpedo gun-boats the advantage, in spite of the 6 or 7 knots more speed of the torpedo-boats in smooth water, yet they cannot be considered efficient destroyers unless they have considerably the advantage in speed in all weathers. Hence the introduction of the new torpedo-boat destroyers, which have firstly the all-important element of speed, and are of sufficient size to maintain a high speed in moderate weather.

It will be seen from the diagram that they greatly resemble enlarged torpedo-boats; and it may be noted here that this was made a special feature of the design, as it was considered important that they should not be easily distinguishable from torpedo-boats at a distance, and it was thought that the disguise to their character which would result from this would probably be of considerable service.

Although these destroyers are considerably larger than the torpedo-boats, their dimensions have been kept as small as it was possible to

fulfil the conditions, which consist in being able to maintain a speed of 27 knots for three hours ; and carry all stores and ammunition for their gun and torpedo armament, which consists of one 12-pounder Q.F. gun, five 6-pounder Q.F. guns, and two tubes for 18-inch torpedoes.

The dimensions of the "Daring," which is one of the first order for destroyers, are—length 185 feet, beam 19 feet, with an extreme draught of 7 feet.

In the second order, of which my firm built the "Ardent," "Boxer," and "Bruizer," the length was increased to 200 feet, the additional length being required for extra crew accommodation.

In the 30-knot destroyers which we have just undertaken, we have found it necessary to still further increase the dimensions.

The very large power required for the torpedo-boat destroyers, of which the "Daring" may be taken as an example, to attain their speed, indicates the enormous difficulties which bar the way to attaining equal speed in larger vessels, for although there is economy of power to be obtained generally by increased size of vessel, this rule is subject to complete reversal under certain conditions, which can be explained by Froude's rule of corresponding speeds, which show that although we can attain a speed of 30 knots economically in a vessel of about the size of the present destroyers, if we increase the displacement three or four times the performance is far less satisfactory ; and if we go on increasing we shall not arrive at a size favourable to this speed until we get to the largest dimensions.

I will now call your attention to the curves of performance we obtained from the "Daring's" progressive trials, and I think the data given will be of interest to officers having charge of this class of vessel, as the variation in H.P. for different speeds and the different slip of the screw cause variations in the co-efficients of performance which are not only interesting from a scientific point of view, but also afford valuable information for determining the best speed, etc., at which to run to attain any particular object most efficiently.

The variations in the co-efficients of performance are very interesting. At about 12 knots it reaches its highest value, being as much as 250 ; at 18 knots it falls to 200, which is still a very good performance ; and at 24 knots a temporary minimum seems to be attained. After this speed up to the highest, 29 knots, the co-efficient goes on improving; and it was evident from the formation of the wave surface, as seen from the vessel, that as the speed increased after a certain rate the disturbance became distinctly less.

The curve of slip is also instructive, as indicating the large amount of work wasted in wave-making at about 24 knots. With some of the screws we tried, a very curious effect was made evident. When they were taxed beyond a certain limit, a sudden increase in slip was developed, and it was found that this was due to the insufficient blade surface, which caused the loss of pressure at the back of the blade to be so great that the available head of water could no longer cause it to keep pace with the

retiring screw-blade; thus leaving a hollow space which materially interfered with the action of the propeller, and at the same time set up vibration, which did not exist when the screw was working properly.

The wave profile at 28 knots is shown in Fig. 3. It will be noticed that there is very little squatting by the stern. The large area of load-water plane at the aft part of the vessel prevents any great change of trim, and the immersion of the stern is actually less at full speed than when at rest, because the water leaves it perfectly cleanly at the abrupt corner formed by the buttock lines.

It will be interesting to compare this peculiar form of stern, which has many advantages, besides good qualities for speed, with the best form of stern of the ordinary type as in the "Speedy's" model. In her case, when running at full speed at a distance of about 20 feet from the stern, the screw race rose to some 2 feet above the level of the deck, causing very large waves, while the race from the "Daring" was quite flat.

One great advantage of the flat form of stern is its capacity for never leaving the water and allowing the screws to race. Indeed, we have kept on with trials in these boats in weather when it would be quite impossible with an ordinary stern.

The destroyers are necessarily quick rollers from their small size, and have a metacentric height, with all weights on board and 30 tons of coal in the bunkers, of 2·48 feet.

The righting moment, as shown from the stability curve, is a maximum at 46° and vanishes at 95°. There is a noticeable change in the stability conditions. At full speed the vessel appears to be more tender, and although this impression is, perhaps, chiefly due to the greater heeling effect of small movements of the helm at high speed. the stability is actually reduced, as compared with the normal still-water condition. The change in the water-line, which falls amidships and rises at the finer parts of the vessel, at the stem and stern, reduces the metacentric height.

The quick-rolling properties of these vessels, and the consequent difficulty of efficient use of the guns, make me look forward with great interest to the trial that is to be made on two vessels of this class, of fitting the "Tower" steady gun platform—an apparatus, the merits of which I think have not been fully appreciated; but this may be partly due to the fact that the trials which have been made have not been carried out in a sufficiently public manner to bring them before the notice of those who are greatly interested in attaining the highest results from guns at sea.

From the earliest days of the torpedo-boat, the question of protecting the vital parts and the men by armour has been considered, but only the conning tower has been universally afforded protection. In the smaller vessels intended for carrying on deck, I think it is a question if it is even advisable to retain this; for so important is lightness in these small vessels, that the French authorities are building a number of their second class boats in aluminium.

It may be that for the torpedo-boat destroyer protection to the conning tower can be afforded, but protection to the machinery involves the addition of too much weight; the real protection of the vessel is its speed, which enables it to reduce to a very short period the time it is under fire, or, in other words, its armour must consist in the distance it can put between itself and its enemy in a short time.

The effect of protecting the whole of the machine space with ⅜-inch high grade steel, which is only sufficient to stop the Lee-Metford bullet, would mean the addition of thirteen tons in weight; this, we have found by trial would reduce the speed by one knot, which is too large a loss for so small a gain in protection.

Lightness is one of the most essential features when high speed is required in a small vessel, and in the torpedo-boat destroyer the whole design must be prepared with this in view; and I am of opinion that there are many fittings which are carried, suitable, no doubt, for the class of vessel for which they were designed, but most unsuitable for these very special vessels, which require considerable modifications.

In the propelling machinery of the "Daring" and her sister-vessels, particular care has been taken to keep down the weight and reduce the stress on the various parts to a minimum.

With this object in view, each set of engines has four cylinders, which secure a better balance, two low-pressure cylinders taking the place of one, as in the ordinary triple-compound engine. The running of these engines has been most satisfactory, and thus justifies the addition of some more moving parts beyond those necessary with the three-cylinder type.

To obtain great power with limited weight of material involves great care, both in construction and the no less important working of the machinery. The engines must make many turns in a short time, because the power which can be developed by them depends on the speed of turning, the boilers must also work at high speed, which means that combustion in the furnace must be intense and rapid, so that the products of combustion are of a high temperature; a large quantity of coal is burnt on a limited area of fire grate, a large amount of heat passes through a limited surface in the generating tubes, and a volume of water equal to the whole contents of the boiler is evaporated in a short time. These conditions require the greatest watchfulness on the part of the stokers, because with this rapid working any deficiency of water will allow the boiler to be overheated in a very short time, and it becomes necessary to assist, by automatic gear, those who have charge of the water-feeding appliances.

An idea may be gained of the difficulty here involved when it is stated that the water in an ordinary marine boiler is equal to the amount evaporated in 100 minutes, while for one of "Daring's" boilers the time is only ten minutes.

In like manner the stokers have to exert themselves much more than when firing the ordinary slow-working boiler, for when the boat is running at full speed, if the crew are divided in two watches, it would mean that

each man must stoke about 600-I.H.P. of boiler, which is many times the ordinary rate of working, and necessarily requires very good men.

Again, as it is important to run the engines very fast, it may be interesting to consider how the artificers in charge of them are taxed by this necessity, and compare the running of torpedo-boat engines with the engines that were used in the first steam vessels, which made few revolutions in a minute, examples of which are still to be found in tug-boats, for which they are suitable. We find in the tug-boat engine only one steam cylinder; the driver stands with levers and valves within his reach, so fitted as to enable him to control the motion of the piston by their means, and to arrest its slow motion at any part of its stroke. By this means, although the engine has only a single crank, the motion of the paddle wheels can be governed with great nicety and stopped within half a revolution or less of any point desired.

Any want of adjustment in the engine can be detected by sound, by feeling, or by sight, and this is the order in which the senses are of importance for the engine driver. In the slow movement of the single engine all the sounds can be identified, the motion is not so rapid as to prevent any part from being felt with but little danger to the skilful hand, and it can be seen at what part of the revolution any particular new noise takes place; in this way its cause may often be detected and a suitable remedy devised.

If we turn from this comfortable working heavy engine to the high-speed torpedo-boat engine working at its highest power, we then note that the sound in the engine-room is confused by the addition of a number of auxiliary engines, each adding their own particular series of sounds to the now at least three cylinders of the main engine, and all these engines making a confusion which is further complicated by the fact that the auxiliary engines in their rate of working keep no constant ratio to each other or the main engines; they may be considered as part of an orchestra having a separate conductor for each instrument. Now take the next important sense for the engine-driver feeling. The engines are revolving, say, 400 revolutions in a minute, and the important moving parts must be touched by the fingers, and any change of temperature detected promptly. If this is not done heating may ensue, which may oblige the engines to be stopped. In this rapid working the eye is even put to a great disadvantage. The motion is so rapid that no particular position of any working part can be assigned to it, while spray of water and oil is thrown in the eyes and the vision temporarily impaired.

However, this description only applies to running at the highest speed, for when the speed is reduced to that used for ordinary cruising, the stresses on the parts are so small that the complicated machine has few parts which require special attention, and all comes under easy control.

In the stokehold, also, there is a great contrast between full-speed and cruising. The latter only involves the use of, perhaps, half the

boilers, working so easily that the fires are dull and continue to do their work without any attention.

At full power the firing scarcely ceases, and the forced draught gives such a high temperature in the furnaces as to render the light blinding and painful to the eyes, making the use of coloured glass necessary to protect the eyes when examining the furnace to see in what part the fuel is most required. The space for stoking is limited, and the coal bunkers being small, cannot afford convenient room for the coal being rapidly trimmed from them. The very large amount of air passing through the stokehold causes the coal dust to be carried about so as to be most unpleasant. In all this dust and hurry the water level and steam pressure must be attentively watched, and we owe much to our stokers for performing these duties which are of the first importance for the speed and safety of the boat.

How the crew fare on deck depends much on the weather and the relative motion of the boat to the wind and tide, but it generally requires considerable sea to make it uncomfortable on deck when the boats are working at their proper draught of water; overloading, however, soon makes itself apparent by not only loss of speed, but discomfort on deck.

It may be objected that the torpedo-boat destroyers have too large freeboard, thus rendering them unnecessarily visible at a distance; but this is not so. They are intended to run at high speed in a moderate sea, and if they had not this high freeboard they would undoubtedly take water on board in such volume as to endanger everything on deck. Therefore their source of invisibility must depend on suitable colouring.

It has generally been assumed that a uniform tint is the best, and in the British Navy a dead black is preferred. If, as I have already pointed out, the colours of birds—which are difficult to distinguish from their surroundings—are examined, they are found to consist of irregular patches of colour by which the form is concealed; and by one part blending with the background no continuous outline is given capable of revealing its form.

The effort made to perfect diving and submarine boats leads to the consideration of the effect on torpedo-boat destroyers of provision to temporarily deeply immerse them, so as to give them the advantage of reduced visibility which the submarine boats possess. But I do not think any advance can be made in this direction in a vessel in which speed is such an important quality. The additional fittings required for this purpose would be of such weight that the high speed would be lost, and if such vessels are really of value they must form a separate class.

One effect produced by the high speed attained with the torpedo-boat destroyers, which owe their origin to a desire to protect the larger war vessels of the Navy from torpedo-boat attacks, will, I think, be to cause an effort to be made to increase the speed of the larger ships which may be in danger, owing to the fact that a much more powerful torpedo-boat has been made, which is much more dangerous to them than the torpedo-boat they were made to destroy; and to increase the speed of the

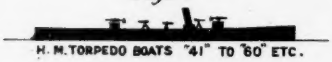
large vessels, as I have already indicated, so far as to remove this new danger will be a matter of considerable difficulty, but it is possible that some of the devices to which the speed of the torpedo-boat destroyers is due may be of service to the designers of the larger ships.

At the close of the lecture a number of lantern slides were exhibited showing the development of torpedo-boats from the smallest built by Mr. Thornycroft's firm up to the "Daring" and the "Speedy."

Admiral H. F. CLEVELAND: My lord, ladies and gentlemen,—I rise to take part in the discussion because I have had the opportunity, quite recently, through the courtesy of Mr. Thornycroft, of spending a day in one of these boats in the North Sea, and I was very much struck with all I saw. It must be borne in mind that these boats are entirely in their infancy, and it is almost impossible to criticise any details of them till we have had more practical knowledge of their working at sea. One thing particularly struck me, namely, the inutility of attempting to disguise their character (as suggested by Mr. Thornycroft), by painting them a suitable colour, which would otherwise be of considerable service, so long as a fierce flame was allowed to issue continuously from the funnel. I would ask Mr. Thornycroft if he has managed to overcome this grave defect. With regard to the "Tower" steady gun platform, I shall be very glad to see the result of the coming trial, but I very much doubt any success with it in this class of vessel, considering that they have very quick motion, and I doubt very much whether the gun fire would be improved by any such device; but as Mr. Thornycroft says it is to be tried, we shall see the result. I agree with Mr. Thornycroft upon the question of the fittings. "I am of opinion," he says, "that there are many fittings which are carried, suitable, no doubt, for the class of vessel for which they were designed, but most unsuitable for these very special vessels, which require considerable modifications." I am decidedly of the same opinion. You will be aware that these vessels are built specially to destroy torpedo-boats. They are armed with a very fair armament—not quite sufficiently to my mind, but they have also torpedo tubes in them. I am rather inclined to think that carrying *both* guns and torpedoes is a mistake. Of course, it is undeniable that these tubes must add greatly to the weight of the vessel, and we know that the great desideratum in these vessels is to keep down the weights as much as possible. The question of maintaining the water level in the boiler is a very serious one. I noticed that difficulty when I was down in the boiler room, and Mr. Thornycroft says in the paper that the water level and the steam pressure must be attentively watched. When you consider that the whole of the water is evaporated in ten minutes, it is a very important matter that the water supply should be unerringly maintained in the boiler. It struck me as a thing which required a very great deal of consideration. I think that is all I have to say upon the matter. The value of these boats as torpedo-boat destroyers requires a great deal more practical working out before we can arrive at any conclusion respecting them, although we must all admit the necessity of some special vessel for the purpose.

Captain F. N. MAUDE, R.E. (Ret.): I should like to ask Mr. Thornycroft what attitude he adopts towards the use of liquid fuel in these boilers. He has described in his paper most graphically, and, as most of us know, most truthfully, what the inside of a stokehold is like at high speed; but if you employ liquid fuel, you get rid of all that trouble. If you can run a locomotive on the Great Eastern at 75 miles an hour with this fuel, I should very much wish to know why you cannot use it on board a ship. There is one other question I should like to ask, viz, what Mr. Thornycroft has in his mind when he spoke of the cost of aluminium as being prohibitive for second class boats, because the prices are falling so fast and are coming down so rapidly that I hope that that will not endure much longer.

Figs: 1



H. M. TORPEDO BOATS "41" TO "60" ETC.

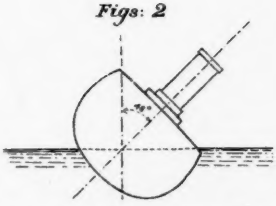
H. M. S. "DARING."

H. M. S. "RATTLESNAKE".

H. M. S. "SPEEDY".

H. M. S. "HALCYON"

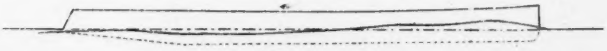
Figs: 2



ANGLE OF HEEL FOR MAXIMUM RIGHTING-MOMENT.

H.M.S. "DARING" – STABILITY CURVE.

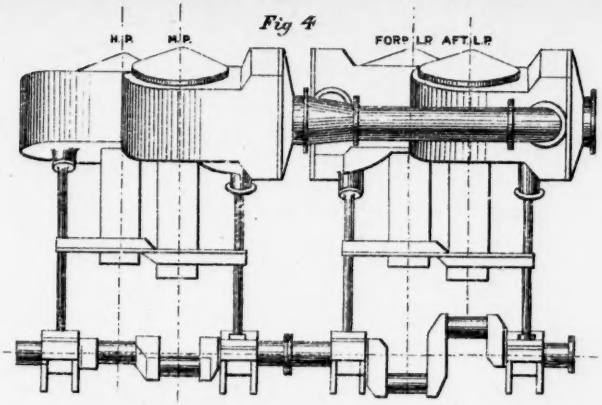
Fig: 3



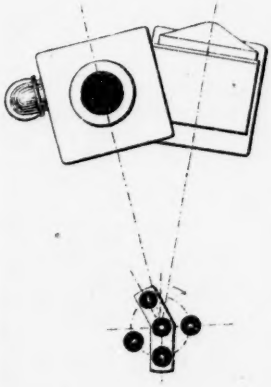
WAVE PROFILE AT 28 KNOTS

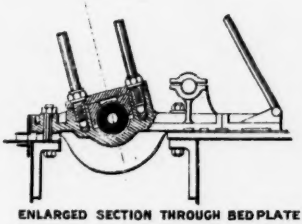
J. J. KELLNER & Co LITHO. LONDON.

Fig 4



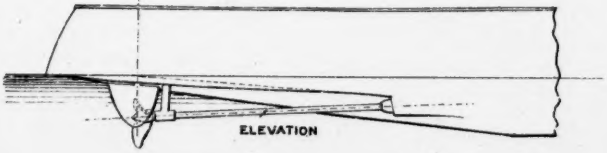
ENGINES OF H.M.S. "DARING."



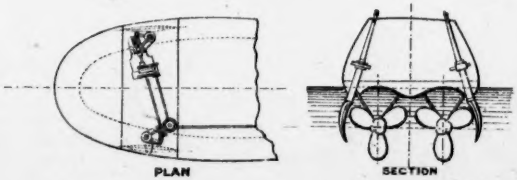


ENLARGED SECTION THROUGH BEDPLATE

Figs: 5



ELEVATION



PLAN

SECTION

Admiral Sir HOUSTON STEWART: I should like to ask Mr. Thornycroft, as an old acquaintance for whom I have great respect and regard, a question. The late Mr. Froude, whom I knew intimately well—and we all know what great value was attached to his experiments—used to say, and also to prove, that you might reduce the rolling of a vessel to almost nothing if you put a large enough bilge keel. To him I think we may say we owe the introduction, certainly the successful proving of the value, of bilge keels to ships. Would it be possible to increase the bilge keels of torpedo-boats so as very materially to reduce their violent motions? I ask this for information, remembering the opinions the late Mr. Froude entertained as to the great utility of bilge keels for reducing the rolling motion at sea, a point of the utmost importance.

Captain S. M. EARDLEY-WILMOT, R.N. (Ret.): I think it would be a pity if this meeting were to separate without a little further discussion upon this most important subject, which has been brought before us to-day with such ability by Mr. Thornycroft. If he would allow me, I should like to correct him upon one point. In the history he has given of torpedo-boat destroyers he states that in 1885 "it was decided to build a class of boat for this purpose." That is perfectly correct, because at that time there was a fear of hostilities with a certain Power, and it was desirable that in the event of our squadrons being employed off its coasts they should be defended against torpedo-boat attack, and an order was given for a large number of torpedo-boats that were intended for this purpose. The Admiralty were rather ridiculed because when they ordered the torpedo-boats they did not order the torpedo equipment, but it was because these boats were intended to be armed with machine guns as torpedo-boat destroyers. That was the first and till very recently the only time when we had in view craft specially for the work of torpedo-boat destroyers. Mr. Thornycroft goes on to say, "In 1886 catchers of a new type represented by the 'Rattlesnake' were built." The "Rattlesnake" type were not built for torpedo-boat attackers or destroyers. For a great many years previous to that time the torpedo officers of the Service, of whom I was one, were desirous of obtaining sea-going torpedo vessels capable of maintaining the sea with our fleets and squadrons, which would under the cover of the smoke and confusion of an action be able to rush in and torpedo the enemy. It was felt that the torpedo-boat as it then existed was not capable of this service, that she could not keep the sea with our squadrons, and that a larger type of vessel should be built for this purpose. The French at that time had commenced the "Bombe" class, vessels of 350 and 400 tons, to accompany their squadrons as torpedo vessels. These considerations led to the design of our "Scout," a vessel of 1,500 tons, carrying a large number of torpedo tubes But this vessel did not represent the views of torpedo officers, and then the "Rattlesnake" type was designed of about 500 tons to accompany the fleet as torpedo-vessels. At the same time, she was not only given a torpedo armament, but she was fitted with a number of guns as well, so that she might be considered, perhaps, a vessel to destroy torpedo-boats as well as to attack with torpedoes. She was, however, called a torpedo gun-boat. The design was reproduced on a larger scale in succeeding vessels of this type. Their dimensions have now reached 1,000 tons. We come now to the torpedo-boat destroyers proper, of which the "Havock," the "Hornet," and the "Daring" are types. They may be considered as a superior type of torpedo-boat which, suitably armed with machine-guns, would be very effective for destroying torpedo-boats in narrow waters and for operating from an immediate base, to which they could return at short intervals. But these boats, although most useful when acting from a harbour or in the narrow waters of the Channel, would not be suitable for keeping the sea off an enemy's coast in the Atlantic watching for torpedo-boats which might come out to attack our squadron. The general opinion in the Navy is, I think, that for such service we require much larger dimensions. Therefore, although I do not wish to say one word in disparagement of these torpedo-

boat destroyers as we know them now, I think we should not neglect at the same time those larger vessels which, if our fleet is going to perform the work it did of old off an enemy's coast for considerable periods of time, must be provided. I was pleased to hear from Admiral Cleveland that he rather questioned the policy of putting these torpedo tubes in torpedo-boat destroyers. The object of a torpedo-boat destroyer is to destroy torpedo-boats, and this is not done by attacking them with torpedoes, but by having as many machine-guns capable of stopping a torpedo-boat as she is able to carry. It appears to me that if, in addition to a certain number of machine-guns, you absorb weight and space with torpedo tubes, you are to a certain extent reducing her efficiency as a torpedo-boat destroyer. At the same time, should we want to employ these craft as torpedo-boats, you should be able to put into them a torpedo equipment; but she should not carry the dual armament under the ordinary conditions of her work as a torpedo-boat destroyer.

Mr. H. O. ARNOLD FORSTER, M.P.: My excuse for venturing to trouble this meeting is this, that I have had the privilege of being present at a great many runs of these boats. I have not only seen a good deal of them, both here and on the Continent, but I have recently been down to see these boats after their return from the manœuvres, and to see the new boats which are building upon the Clyde. Through Mr. Thornycroft's courtesy I had the pleasure of making the trial runs in the "Daring," and have done the same in boats of other makers belonging to this class. But though I have had some opportunities for getting a little information, there is a great deal of information I am still very anxious to obtain, and on one point in particular. The old first class torpedo-boats had one very great disadvantage, that the moment a head sea rose, the faster they steamed the more certain they would go to the bottom; that is to say, there was a point when they could not use their engines at full power without endangering themselves. I have seen them at sea, and have observed the fact; and I have very often asked officers as to what was the falling off of speed of a first class torpedo-boat in a heavy sea, and the evidence has been practically identical, from whatever source I gained it, to the effect that the falling off of speed of the first class torpedo-boats in a sea-way was so great that they were practically at the mercy of any tolerably efficient first or second class cruiser which might come up to them. I think that is a matter which was conclusively proved during the manœuvres in the Irish Channel, when over and over again, unless I am mistaken, the first and second class cruisers, or even I think I may say, in some cases, those unfortunate and unsuccessful boats of which the "Rattlesnake" was a prototype, actually ran down first class torpedo-boats, theoretically running at 10 or 12 knots higher speed. I know there have been several officers recently at sea testing both the "Hornet," "Havoc," and "Daring" in the Channel, and what I should like to hear from some experts in this meeting who have been present on these occasions is, What is the effect of a heavy sea upon the new boats? Because the practical application of it is this, that we have to consider what might happen in the Channel, and we want to make it very serious indeed for a boat which, in the early morning, is off our south coast, and finds herself in the presence of one of our torpedo-boat destroyers, and if our boat could hold the sea and they could not, such a boat would certainly be a valuable contribution to the Navy. There is another point, also, I should like information upon. I was not able to take the opportunity offered to me of seeing one of these boats carrying out gun practice at sea. I should like to know what these 12-pounder guns—singularly powerful guns—are really able to do in anything approaching to a sea upon the forecastle of one of these boats. That does seem to me enormously to affect their value for the particular purpose for which the boats are designed. I believe they could be successfully worked, but I should like to have it stated on very much better authority than my own whether they could use these 12-pounder guns with

sufficient accuracy to be formidable in anything like ordinary Channel weather; and lastly, I should like someone to tell me what, in his opinion, and the opinion of those who are really acquainted with the working of these boats, is the necessity for specially-trained crews. I am perfectly certain Mr. Thornycroft and everybody who is familiar with the engineering part of these boats would tell me that, so far as the stokehold complement goes, it is absolutely necessary that it should be composed of men who are not merely acquainted with the working of engines under steam, but who are specially acquainted with the working of high-pressure engines with a very high rate of revolution, and with the peculiar boilers which are adopted in this class of vessel, and in others of a similar type. I know, and many here know, what happened to one boat during the last manœuvres, and certainly I think that the calamities which occurred to the "Hornet" were attributable to the fact that the men on board in the stokehold, although skilled stokers and engineers, were not familiar with the particular class of engines which they were handling. There is no doubt that vessel went to sea not with the crew which had been working her for some time past, but with a new crew put into her utterly unacquainted with her peculiarities; and if it be true that there is this necessity for specially-trained stokehold crews in these vessels, surely it points to the conclusion that there should be a much more extended commissioning of them than there is at present. These boats, instead of being laid up as they are as part of the equipment of a dockyard, should be kept constantly in commission, and the work of handling them, both on deck and in the stokehold, should be made a speciality in the Navy before that speciality is actually called upon for service. Otherwise, certainly when we send these boats to sea, we shall have a large number of breakdowns which will not in any way be the necessary outcome of the construction of the boat, and which cannot be attributed to the want of technical and skilled knowledge on the part of the men who handle them, but will be attributable simply to the fact that you are putting the men to new work. Even the commonest sailing boat has peculiarities and tricks. There are no two boats quite alike. Anybody who has ever been on a boat knows that boats built yard for yard and inch for inch the same will turn out with peculiarities. How much more so is that the case with boats of this complicated nature and with these special features, any professional man in this room knows very well. If any officer will give us his opinion upon this matter I shall be very much obliged. What I want to know is whether it be the professional naval opinion and the engineering opinion that we must, if we are to get full value out of these boats, have crews constantly commissioned to the boats, for if that is so we must have a revolution in the practice which tends to make the boats part of the equipment of the dockyard, and not part of a mobile fleet which we are to rely upon if we go to war. These are the three questions I would put to Mr. Thornycroft or any officer: (1) What is the value of these boats in a sea-way? (2) What is the value of these boats as gun platforms? (3) What is the value of these boats unless they are supplied with engine-room and deck crews who are specially acquainted with their construction?

Mr. C. HUMPHREY WINGFIELD: There is one small point, not exactly of technical interest, but which may be worth mentioning as an unlooked-for outcome of high speed. As originally designed these torpedo-boat destroyers carried three torpedo tubes, one of which was in the bow. On trial the torpedo-boat destroyers made by Mr. Thornycroft proved to be so very much faster than any torpedo, that the officers were afraid of being hoist with their own petard, and so the torpedo tube in the bow had to be disused lest they should be blown up with their own missile.

Mr. THORNYCROFT, in reply, said: The first difficulty which was suggested by Admiral Cleveland was the flaming funnel. Well, in our early experiments we had an example partly of what trained stokers can do. By putting sufficient coal on the fire you can distil gas in the furnace and burn it in the top of the funnel.

That is one cause of the flame. The other cause of the flame is that when these boats are taxed to their very utmost, the capacity of the boilers is not sufficient to absorb all the heat, and some heat must necessarily come out. But the difficulty which Admiral Cleveland suggested can be partly overcome, and I believe very greatly overcome, by proper provision for air in the furnace; and we have made some experiments with a view to overcome that difficulty by adding more air to the furnace and by the better mixing of gases, and we believe that will solve the difficulty. In the experiments we have made, when we have taken visitors on the trials, we have been trying to get the very last half knot, and everybody knows that not only horses but steamboats get out of breath when they are doing their very best. By reducing the speed a very little, I believe this difficulty can be overcome; but it requires skill on the part of the stokers. With regard to the torpedo tubes, the question as to whether the boats should or should not carry them was, I think, discussed by Admiral Cleveland, and I certainly am of opinion, as is Captain Eardley-Wilmot, that these boats should go out either as torpedo-boat destroyers or as torpedo-boats, and the one armament, of course, should be left ashore, and then the boats would be better adapted to the one particular function for which they were aiming. But I do feel this, that as torpedo-boats these new boats are most excellent, and in that function, of course, they should not carry 12-pounder guns. With regard to the water-level, Admiral Cleveland suggested that there was a difficulty in maintaining the water-level in the boiler. In our first experiments we found that it was most difficult to maintain the water-level in the boiler, but in the entrance to this Institution you will see to-day a tank in which we test the apparatus for doing that work automatically. The apparatus we devised is so successful that in our recent trials the water-level has been untouched for as much as three hours at the highest speed; so that no great skill is required on the part of the men to do this. They have merely to watch the apparatus and see that it does what it ought to do, and if it won't do its work, then they must step in; but so far it does its work perfectly. The same apparatus has been fitted in H.M. gun-boat "Speedy," and it has worked so well from the very first that we have orders from the Admiralty for fitting it up in other vessels of the same class. Captain Maude spoke of the price of aluminium, and hinted that it might be had, perhaps, very much more cheaply. He wished to know what price I thought was prohibitive. The price which I think is prohibitive is 2s. a pound. Captain Maude talked of 10d. a pound, but we have not been able to get it at that price at present. Admiral Sir Houston Stewart talked about the effect of bilge keels. He said Froude had shown how great was the value of bilge keels in these vessels. I am glad to be able to tell you that the use of bilge keels, or rather one large central keel, which is admissible in small vessels, has been used by the Danes with success. I believe in the Baltic the short, quick seas to be found there are more troublesome than our seas, and some boats we built for the Danes gave trouble, and they found it an advantage to have a large keel. They did not quite approach the modern sailing boat, but it is quite evident from the behaviour of a model that it does stop the rolling. The Danes have done that to some considerable extent, and without interfering with the steering qualities of the boat they have got a very great reduction in the unpleasant motion of the boat in a sea-way. Admiral Cleveland spoke of the use of the "Tower" gun-platform as being probably unsatisfactory. I watched that with great interest, and I noticed the behaviour of the light shining from the platforms of a "Tower" gun on a boat of quick period. One point which Admiral Cleveland made was that it was probably impossible on a boat of quick period like a torpedo-boat that this apparatus could be really effective. I am glad to say that Mr. Tower has overcome the difficulty even of a boat of quick period, because he had a little boat—I forget the name of it, but it was a very small boat—and I stood on the platform myself, taking the part of a gun, and although I was quite steady, and the model gun it had could be pointed to keep on an object without great

difficulty, the boat was moving quite rapidly, I think with a period of certainly not more than 3½ seconds for the completed double roll. It was most rapid, but under those great difficulties this apparatus kept the thing steady. Captain Eardley-Wilmot has put a number of questions before me, and I am not sure that I can remember them all. He recalls the history of the torpedo gun-boat, and I am glad to learn that these boats were not built for catchers. I thought it was really their inability to catch which caused the change of name, but I am glad to hear they were really built for that function which is a difficult one, because the boats of the "Daring" class are not, I think, as he very properly says, adapted for keeping the Atlantic in bad weather and for waiting and watching, and that for that purpose you want a vessel of more size. But the thing I pointed out which makes this thing very difficult is that, so soon as you increase the size of the torpedo-boat destroyer to larger dimensions, you get to a condition which is unfavourable for speed, but for the particular object in view I think, perhaps, less speed would be serviceable; and it does point to a higher speed being desirable that should be attained in what we call a third class cruiser, which is better adapted for this service. With regard to the question which has been put by Mr. Arnold Foster, about the capability of the boats in a head-sea and heavy weather, we have had no experiments at full speed in heavy weather, but when we sent the "Ardent" to Portsmouth we then made at the same time a coal-consumption trial at 13 knots. The speed was 13 knots in quite a strong wind, running down Channel, and that speed was maintained and the steam pressure and everything was kept perfectly steady, although there was this strong wind. That being so, I think it shows that at the speed at which a fleet can ordinarily cruise, this boat was quite as well adapted to keep the sea as a large ship. With regard to trained crews, they certainly are desirable and necessary to get highest results, but Mr. Arnold Forster speaks of a peculiar boiler. Well, I must say that if the boiler were peculiar, it is peculiar in this, that it may be used with less danger by untrained people than an ordinary boiler, and the troubles that have arisen with untrained crews are not to be feared with this. To get the highest results, it is quite right that these boats should be frequently worked and their peculiarities ascertained. They have peculiarities, and one peculiarity, I believe, which gives trouble to seamanship is this, that the power of the engines is so great and a high speed is attained in such a short time, that they are difficult to handle in confined waters. The order is given to go ahead, and before anything can be done, the boat has attained a considerable velocity, and any mistake, such as giving a wrong order, leads to damage before any counter order can be given. That is a point which wants particular attention, and if you look into the theory of it, it is exceedingly simple. You have got a very light mass accelerated by a very large force, and in a large ship you have a very large mass accelerated by a comparatively small force, and consequently the ship does not attain way with the same rapidity, and it gives more time to think. With regard to the gun platform, I am not able to speak. I do not feel competent to say. I think sailors had better give their own opinion. I have heard that men can fire best on a moving platform, but as a landsman I should prefer something that is steady.

The CHAIRMAN (Lord George Hamilton): Before we separate I should like to do what is customary on these occasions, viz., to move a vote of thanks to Mr. Thornycroft for his very interesting lecture. And in doing so I would make one or two observations upon that lecture and the discussion which followed. I did not do so before, because my remarks were few, and they were not of a critical or interrogatory character; in fact, I agree, I think, in the main with what Mr. Thornycroft has stated, and also with the speech of Captain Wilmot. I do not like the multiplication of names of vessels in H.M. Service, and, although it may now be the fashion to call these vessels torpedo-boat destroyers, it is perfectly clear they are only enlarged torpedo-boats, that is to say, they are

vessels of a higher speed than the ordinary torpedo-boats; they carry torpedoes just in the same way, but they have a larger armament of small guns. We might as well call a large gun-boat a gun-boat destroyer, because it would be able to eat up and overcome any vessel of smaller dimensions and less speed with which it came in contact. But these torpedo-boats are a very marked improvement on anything that has been built before. In this lecture Mr. Thornycroft calls attention to one fact which to a certain extent was new to me, and that was that according to certain scientific rules, if the displacement of these vessels was increased, the performance would be less satisfactory, and he went on to say that if we were to go on increasing we should not arrive at a size favourable even to the attainment of this speed or higher speed, unless we got vessels of much larger dimensions. Now, with regard to the vessels which preceded these, although they were of a different class, which are popularly called torpedo catchers, but are, as Captain Wilmot described them, torpedo gun-boats—the first of those vessels were a great success. Captain Wilmot has exactly described the purposes for which they were built, and the first vessel, the "Rattlesnake," with 550 tons attained a speed of 19 knots, and, I believe, maintained that speed continuously for a considerable period in a sea-way. We went on building those vessels, we went on increasing their size and putting more and more power into them, and we practically never improved upon them. I am curious to know whether it was for the reason Mr. Thornycroft gives, and whether in those vessels the conditions are the same as he considers applicable to the "Daring," and that you cannot increase that particular class of boat beyond 500 to 1,000 tons and get a corresponding increase in speed. Because it is remarkable that even in the "Speedy," where Mr. Thornycroft with the water-tube boilers has developed a much higher I.H.P. than in any other vessel of a similar class, that vessel has only attained, I think, a speed of from 20 to 20½ knots. That vessel has double the displacement of the "Rattlesnake," and the "Rattlesnake's" speed is 19 knots, and, therefore, although seven or eight years have elapsed since the "Rattlesnake" was built, and we have had vessels of the same class with double the displacement, the improvement in speed is very slight. Therefore, I think we may be pretty sure that if we want to build boats for the protection of our larger vessels, we shall not be able to attain a very high speed if we get to anything like a tonnage of, say, 1,000 tons displacement, and that we must trust to vessels of the dimensions of the "Daring," or somewhat larger, to undertake and perform these services. Mr. Thornycroft hoped that no fault would be found with the increased freeboard of these vessels. I speak, not as an expert, but as a layman, but my impression is that very few naval officers will find fault with any naval architect who increases the freeboard of the vessels in which they live. I think we have gone far too much in the direction of low freeboard, and Mr. Thornycroft will remember in 1885 the Admiralty designed twenty torpedo-boats of high driving power and low freeboard, and in every single instance the freeboard had to be raised. I remember having a very interesting talk some years ago with an officer whose premature death was a great loss to the Navy—I mean Admiral Long—particularly on a question of this kind. Admiral Long not only commanded the "Vernon" with great distinction for some years, but he on two or three occasions took out a fleet of torpedo-boats and torpedo gun-boats, and he was an officer who combined science and practice to a high degree; and his reports and opinions, I think, were of the greatest value. I remember that he told me—and I believe it was not only his experience, but the experience of the officers generally—that he was surprised in a sea-way, if there was any motion in the sea, what a very little difference the size of the torpedo-boat made; that, whether it was, comparatively speaking, an old-fashioned torpedo-boat, or whether it was of the size even of the "Rattlesnake," coming end on, it threw up so large a wave, that the increase in displacement in no way afforded a correspondingly increased target. It seems to me quite clear that if we are to improve—and I hope we shall

improve these vessels and develop year by year the highest rate of speed—that rate of speed must be associated with a higher freeboard. Admiral Cleveland's opinion is that it is advisable not to arm these vessels with torpedoes. There is something to be said for that opinion; but, on the other hand, I have always been told that one of the effects of a torpedo-boat is—I use the expression in no offensive sense—the great moral funk which it causes to the vessels against which it operates. If you arm those vessels with a torpedo, every vessel of whatever dimensions against which they have to operate will keep clear of that vessel; if, on the other hand, you take the torpedoes out of it, no vessel except a torpedo-boat will care for it, because it is armed with guns so small, that they can make no effect upon vessels of any large size. Therefore, although I admit there is a great deal to be said from Admiral Cleveland's point of view, I think the balance of argument is in favour of having the vessels armed as the Admiralty has directed. May I give one little piece of advice to Mr. Thornycroft?—it is the only criticism I will venture to make. He has gone into the question of the colour, and of painting these torpedo-boats. Now, that is a very ticklish question; and I see he suggests that there should be some irregular patches of colour put upon these torpedo-boats. Well now, the smartest lieutenants in the Navy are always pleased to be associated with fast torpedo-boats, and take a great pride in their vessels; but if they find that their vessels are to be made like Joseph's coat, decorated with irregular patches of colour, I am afraid that Mr. Thornycroft will touch them upon their very tenderest point, and will alarmingly diminish the popularity of the Service. Therefore, I would strongly recommend him not to go into the question of colour, for it is a burning one in the Navy, and I know from experience that you cannot more deeply wound a naval officer than by making a reflection upon the colour which he has thought necessary to use in decorating the vessel which he is commanding. We have had an instructive and interesting lecture, and for that we are indebted to Mr. Thornycroft. I agree with Admiral Cleveland, we are really only in the infancy of the discussion of this new type of vessels, but at any rate we have the satisfaction of knowing that they are a marked improvement upon anything which has hitherto been built or constructed in any country in the world, and for that marked improvement we are largely indebted to the lecturer, Mr. Thornycroft.

Wednesday, May 22nd, 1895.
Major-General Lord METHUEN, C.B., C.M.G., in the Chair.

KITES: THEIR USES IN WAR.

By Lieut. B. BADEN-POWELL, Scots Guards.

THE following paper is chiefly suggestive. The subject is one almost without a history, and the few attempts hitherto made to practically apply kites to useful purposes have either proved so unsuccessful as not to be worth record in such a general paper as this, or have been so vaguely recounted that the desired details are not forthcoming. To detail all my own experiments would be somewhat wearisome, and it therefore only remains, after briefly referring to all these points, and stating exactly what is undoubtedly known, to give a series of suggestions as to what may be done in this line.

Kites, as toys, have been known from the earliest times. They are probably among the oldest of inventions, are known in almost all parts of the world, and are so common at home that the man probably does not exist who could say he had never seen such a thing. Yet they have but very seldom been applied to any practical purpose. This seems extraordinary, since the principle appears as if it would be applicable in so many different ways; and I hope and believe that when I have finished this paper, all you who will have heard it will agree that vast possibilities lie in the future of the kite.

HISTORY.

Passing over all further reference to this apparatus as a toy, I will briefly refer to the few occasions on which it has been applied to some use, or on which attempts have been so made. Doubtless many other experiments have been carried out; but I find it difficult to collect information on this subject, and I may take this occasion to say that I should be very glad to hear of any facts connected with the subject which I have not referred to.

In 1752 Franklin made his celebrated experiment of drawing electricity from the clouds by means of a kite, and since that time such an appliance has frequently been used in meteorological research, notably in recent years by Archibald, Eddy, and others. Kites have often been used as a means of getting a rope to the top of a tall chimney, or across a river. Pompey's Pillar was ascended in this way, and the first connection of the Niagara Suspension Bridge was carried across by such means. Kites have also frequently been suggested as a means of com-

munication between a stranded vessel and the shore. In 1823 Captain Dansey, R.A., exhibited an apparatus for this object; and Sir George Nares has, on many occasions, demonstrated its great utility.

As regards the employment of kites for purposes of war, the first suggestion that I can find of such an idea is contained in a curious old print published in France in 1803, wherein is depicted an ideal view of the invasion of England. The air is thick with balloons conveying the invaders across the silver streak, while from the shores of Albion a number of kites are seen flying in the air, a marksman hanging from the ends of their tails shooting at the balloons. This may be very prophetic, as we are now working at war kites, while the French are experimenting with dirigible balloons!

Lord Dundonald in 1806 was, I believe, the first, if not the only, man to use kites in actual war. These he flew from his ship as he passed along the coast of France, and by this means he distributed proclamations to the people.

In 1827 Pocock published the results of his experiences with kites, wherein he says that he drew along carriages full of people, sailed boats, and even lifted people by their means; but he gives but few details of how these things were accomplished.

Coming to more recent times, Simmons, the aëronaut, tried in 1876 an apparatus, under the name of the "parakite," for raising a military observer. Several trials were made with the machine at Chatham, but they all seem to have ended in failure. I have not been able to get any sufficiently detailed account of this to be able to account for the failure, but from a photograph I have seen of one of the kites it appears to be on the principle of the Japanese bird-kite, with "pockets" to release the air at the sides.

In 1886 a M. Maillot, in France, tried a very large kite with the object of lifting a man. But the shape was bad and the adjustment of cords such that I am not surprised to hear that, though it lifted a heavy sand-bag off the ground, it was so unsteady as to be considered dangerous for a man to attempt the ascent.

In 1891 another interesting experiment was made in France. M. Batut sent up a small kite with a photographic camera attached to it, by means of which he obtained some good "bird's-eye" views of the ground below from a height of 400 feet.

Recently Captain Pilcher, of the Northumberland Fusiliers, has been experimenting with kites, and I hope he will tell us about them. In Australia a Mr. Hargraves has also lately been at work with what he calls "cellular kites." He has had several large ones made, which have actually lifted him off the ground. He has kindly sent me full details about these kites, and, judging from the results he has obtained, they should prove a very efficient form of aërial apparatus.

Conclusions from Experiments.

As for my own experiments, for many years now, on every opportunity I could seize, I have indulged in the very innocent amusement of kite-

flying, and I have learnt a great deal. Very early in my course of experimenting I discovered the very important and, to me, hitherto incomprehensible, reason of why kites have not been made more use of. I speak authoritatively, but I may here say that I should have been afraid of addressing a distinguished audience, including many persons far senior to myself, were it not a fact that, as a rule, it is the young ones—younger a good deal than myself—who are the greatest authorities on kite-flying; and I will, therefore, ask you all to imagine yourselves young again and to think back of your kite-flying days. Do you ever remember seeing your fascinating toy rise majestically in the air, and just as your proud feelings of triumph had reached their climax the horrid thing slowly turned over and darted with a wild sweep to the ground, smashing itself to pieces and digging its head in the turf? I know the feeling well, and have seen many of my most carefully constructed machines destroy themselves; but it is really aggravating when, despite years of practice, careful study, and the application of theoretical knowledge, you cannot get the kite to go. Difficulties seemed to increase and multiply, and it was only after years of really careful study that I began to at all understand the subject, and I have by no means mastered it yet. Wind is a very fickle force to deal with. It is very little understood, and kite-flying, once the rule-of-thumb patterns are departed from, is a most difficult subject, and is quite enough to turn many earnest inventors to seek other fields; and herein lies the answer to the question of why kites have not further developed. However, after having tried all sorts of forms and shapes and sizes, I was able to put down the following undoubted facts, as the results of my preliminary labours:—

(*a*) That a properly-constructed kite can be made to fly in the very lightest breezes, and that, as a rule, the higher it goes the better it flies, since the wind at a height becomes steadier and more powerful as we ascend. The days on which a kite cannot be flown through lack of wind are very few.

(*b*) That by fitting "side lines" to the kite it can be steered out of the wind course, that is to say, made to fly on either side of the direction of the wind, and this to an extent of at least 45° (under favourable circumstances I have got it through 125°, or 62½° on each side). A kite can thus always be made to fly over any spot within a quarter of a circle away from the wind, and as far as its string will reach.

(*c*) That in an average wind, say, 12 miles an hour, a kite can lift off the ground a weight equal to about ·3 lb. per square foot of area. So that a kite of 500 square feet could lift a man.

(*d*) That if the string of a kite carrying a weight breaks, the kite forms a good parachute and descends gently.

(*e*) The length of the string is practically unlimited, since when a kite has taken out all the string it is able to lift (I have known one take nearly a mile), the end of the string may be affixed to a second kite, and so on.

(*f*) That by suitable arrangements of cords, etc., a kite may be made to fly very steadily without any possibility of its "capsizing."

(*g*) That on a perfectly calm day a kite can be made to float in the air, so long as it is towed along at a rate of at least 4 miles an hour.

Uses to which Kites may be Applied.

On considering the above results, one is lead to contemplate on the various possibilities of turning the apparatus to some account. The following have occurred to me:—

1. *Signalling.*—It may often be desirable in military operations to communicate between bodies of troops, when the usual methods cannot conveniently be carried out. A post high in the air would often then be of value. It would be specially useful to columns on the march in a broken or thickly wooded country, and under such circumstances that it would be dangerous to detach signallers to outlying posts of vantage. A kite could generally be towed along with a moving column, or could be kept floating above a camp. Even at night it might be found practicable to signal with some form of lamp. With this object I have flown small kites, carrying on their strings an ordinary signalling flag, so arranged that a man holding a pole on the ground, and moving it in the same manner as a flag, causes the flag to "wag" as desired.

2. *Photography.*—A kite lifting a camera high in the air can be made to hover over any given spot, more or less to leeward, and the photographs thus taken might be of the greatest value. As I have said, there is practically no limit to distance to which it could be sent, and thus plans of fortifications, camps, and positions might be obtained, as well as accurate surveys of the country, showing roads, rivers, railways, and houses. A camera could easily be devised to take a number of different plates automatically, and by drawing in the string, or steering to one side or other, a complete survey of a large district might be effected. Its position as regards the ground would easily be found by cross bearings or otherwise. I have here some photographs (though not good ones) which I took from a small kite.

3. *Carrying Torpedoes.*—In the same way an explosive bomb or shell could be carried up and caused to float over the enemy's head, and be discharged by time fuse, electric wire, or otherwise. The most powerful explosives could be gently lifted up, and thus a terrible engine of war contrived, so simple that it could be carried by one man, yet more destructive than the most powerful artillery. So long as a point more or less to windward of the enemy could be gained, and a sufficiency of wind existed, this terrible bird of prey might hover over the heads of an enemy; and even if in practice the destructive results were not so great as we might expect, undoubtedly those below would feel somewhat anxious, perhaps experiencing feelings somewhat akin to those of partridges under similar circumstances. I have tested the principle on a small scale, using a bunch of grass (weighing 1 lb.) as a dummy torpedo, to be released by a time fuse, hung from a kite with 500 yards of string. It

worked very well, and I can even answer for the moral effect produced, as an innocent stranger happened to be passing just underneath the kite when the fatal fuse did its (would-be) deadly work.

4. *Raising a Man.*—Although the idea of lifting a man in the air by means of a kite sounds rather visionary (and I often have been assured of the utter impossibility of accomplishing it), yet we must now allow that *that* much is undoubtedly possible, and has been done.

Last year, having come to the conclusion that a kite of 500 square feet ought to be sufficient to raise a man in a fresh breeze, I had a kite of that size constructed, and found my calculations accurate and expectations satisfied by seeing our junior subaltern lifted off the ground. Luckily, another brother officer was at hand with his camera, so you can see for yourselves the pleasure this first successful experiment gave us. This photo is evidence not only of the man having been lifted, but it clearly shows that this was accomplished in no such very strong wind. In a gale the wind will lift anything. Since then I have frequently lifted other men, including myself. This kite weighs complete about 60 lbs., and folds into a package 12 feet long. I now use two such kites connected together; though I am also trying a combination of several smaller kites.

The object of raising a man would usually be for purposes of observation, working the kite apparatus in the same way as a captive balloon. Just upon twelve years ago I read a paper in this Institution on the subject of military ballooning (a peculiar record for a subaltern!). At that time military ballooning was, comparatively, in its infancy. Since then every one of the great Military Powers has taken up the subject, and all authorities agree that it is one of the greatest importance, though there are some who declare that the great amount of transport which must be devoted to a balloon equipment, the uncertainty of its employment owing to excessive wind, and the ease with which the apparatus may become damaged, render the game hardly worth the candle.

A kite apparatus which could take up a man would possess the following advantages over a captive balloon:—

(*a*) *Transport Less.*—A balloon equipment with but one fill of gas requires four wagons. A very slight accident or enemy's bullet may cause the loss of a fill of gas, and three more wagon loads of tubes would be wanted.

(*b*) *Not so liable to be shot down.*—One bullet may bring a balloon down. Hundreds could pass harmlessly through the cover of the kite.

(*c*) *More Durable.*—A balloon is easily torn and damaged. A kite, even if it does get torn or broken, can very readily be temporarily repaired.

(*d*) *Comparatively Uninflammable.*—A balloon, as we know by a recent experience at Aldershot, may be set on fire by lightning, and it would be risky to fire a gun from a balloon.

(*e*) *Quicker sent up.*—A balloon takes a long time to fill, usually three-quarters of an hour.

(*f*) *Wind seldom too strong.*—Captive balloons are almost as often as not unable to ascend owing to too strong a wind.

(*g*) *Easier Controlled.*—Can be made to ascend and descend, and even go to one side by the man in the car.

(*h*) *More Mobile.*—When lowered, it can be more easily moved about under trees, telegraph wires, etc., and may be kept hidden from the view and fire of the enemy.

(*i*) Finally, it is *infinitely cheaper*—a balloon costs, say, £200, and every fill of gas, say, £15. A kite equipment would probably not cost more than £5, and wind is very cheap.

Kites should therefore certainly form a valuable auxiliary to a balloon equipment. But the advantages in their favour are so enormous that they will probably, in my humble opinion, entirely supersede balloons.

5. *Other uses* to which kites may be applied :—

Since, as I have said, an unlimited length of line can be carried by a series of kites, this principle at once suggests itself as a means of communicating with a besieged place. I see no reason why ten or more miles of telegraph wire should not be thus supported at 1,000 feet or so in the air. All that would be necessary would be to start the kites from some point well to windward, the first kite carrying a weighted line which could be released by a time fuse, and the desired length of kite-supported wire paid out. When the first kite was over the besieged place you would wait till the time fuse had burnt out, and then "drop them a line."

A kite might be the means of raising an electric search-light, which could be directed by several cords. It might also be used for holding up any illumination apparatus for working parties at night.

Another simple contrivance which might prove of great value in savage warfare would be the hanging of a torch on the end of a wire from the kite, by means of which native houses or patches of scrub, etc., occupied by the enemy, could be set on fire.

A kite, especially one fitted with guiding lines, might prove a useful means of conveying letters, etc., from one place to another, especially across rivers or other obstacles; such a kite might even be the means of supplying ammunition to the troops in the firing line, or in any detached post.

There are also many other minor uses to which kites might be put. Getting ropes across rivers for bridging purposes, raising flags to show the position of camps, hospitals, etc., or even drawing transport wagons when other means had failed.

6. *Naval uses.*—At sea kites should prove even of more use than on land. The wind there is usually more steady, and during calm weather a steamer could tow a kite beautifully. As an elevated post for looking out for enemy's ships they should prove most valuable, and for piloting the vessel in unknown waters another peculiar advantage comes in, for an observer, say 1,000 feet up in the air can distinguish objects at a considerable distance beneath the surface of the sea. Count Orloff found

that from a captive balloon 1,300 feet high over the Baltic Sea, rocks and sand were clearly defined to a depth of 20 to 23 feet.

For signalling, for aërial torpedoes, for carrying messages between ships, they ought to be useful, while for boat sailing I believe dirigible kites should prove most efficient, and I cannot think why they have not more often been applied to this purpose; there would be no limit to the amount of canvas carried, the boat need not heel over at all, and the wind above is always stronger than below. Lord Dundonald, early in the century, improvised a huge kite out of spars and sails to assist in propelling his ship. Such a contrivance might be of infinite service on a disabled, mastless steamer.

Further Possibilities.

Without being too sanguine about the future developments of this invention, there need be no harm in enumerating various ideas which occur to me as to this.

If the kite succeeds in lifting a man, there seems no reason why that man should not carry and use a rifle, or even a light machine-gun. It requires no great stretch of imagination to suppose that the car might be made of bullet-proof steel, even if Herr Dowe does not succeed in giving us anything lighter. A marksman so "mounted" might make himself very useful, especially in outpost work, or possibly even moving with an advance guard. In savage warfare, in mountainous or enclosed country, this would be especially useful. It *might*, of course, be found that the recoil, especially from a machine-gun, would affect the flight of the kite; but, especially if fired in the opposite direction to the pull of the ropes, I do not see why it should. The man in his bullet-proof car, with kites above him on frames of V-shaped steel rods and with steel wire ropes, ought to be comparatively safe from rifle fire.

I have said that a kite detached from its ground lines forms a large flat parachute. Such a parachute might certainly be directed as it falls, and might thus even be driven against the wind. I have detached a weight-carrying kite when high up, and it has glided down against the wind and fallen to windward of me.

This might develop into a useful method of using a kite. One thousand square feet of kite surface bearing a man at a height of 2,000 feet would take some five minutes falling to earth. During this time it could travel a considerable distance, say 2 miles, with the wind. This might even prove as efficient a means of escaping from a besieged place as a free balloon.

These large kites may have an important bearing on flying machines. Mr. Maxim has already built an enormous apparatus, with extraordinarily powerful engines, and has applied numerous ingenious contrivances. But the great point which has now to be determined is as to the behaviour of such an apparatus in the air, especially when exposed to various irregular currents of wind. One of the best means of ascertaining this is by means of kites. In fact, these aëroplanes are nothing but steam-propelled kites.

and I think it is necessary for us to become conversant with the behaviour and management of a captive kite before attempting to work a steam kite.

Possible Objections to the Use of Kites.

Probably the chief difficulty to be contended with in the general employment of kites is due to a possible

Lack of Wind.—Meteorological statistics, however, show that the general average rate of the wind in England is 12 miles an hour. These general averages are taken, of course, right through the twenty-four hours. But statistics also show that the wind is stronger during the day than during the night; therefore the *day* average is greater than the above. At the Cape the average for thirteen years showed no less than 17 miles an hour. But there is another fact that meteorologists tell us of, which is of the greatest importance in considering this question. Wind passing over the earth may be compared to a stream of water. It is a well-known and undoubted fact that near the banks of a stream the flow of water is so obstructed by the various projections and irregularities of the banks, that the stream is much less rapid there than in the centre of the river. Just the same occurs in the atmosphere. The higher we go (up to a certain distance) the stronger the wind. At a height sufficient to be well clear of all trees and buildings there is a very perceptible increase in the rate of the wind. And thus it very often happens that, while close to the ground it seems perfectly calm, 100 feet up there is a steady breeze. Anemometers placed at a height above the ground invariably show a great increase in the wind force.

As regards the wind power required to raise a man, suppose the apparatus to present 1,100 square feet of surface (as the present apparatus does), and suppose the total weight to be lifted—man, kite, and rope—to be 240 lbs. If it presents an angle of somewhere about 35° to the horizontal, the "lift" derived from the wind will be about ·7 of the total force with which the wind would press were the surface at right angles to its line of force.

If the wind was blowing 8 miles an hour (= ·32 lb. per square foot), it would give a force of ·32 × ·7 = ·224 lb. per square foot, therefore 1,100 square feet should lift 246½ lbs.; and thus a wind of 8 miles an hour should be sufficient to raise the man-carrying apparatus.

In 1893 there were only thirty-five days in the year on which the daily average was less than 8 miles an hour. That is to say, on less than one day in ten was there insufficient wind. In 1894 there were fifty days, which would give about one day a week.

If there is *no* wind—and this is a rare state of things—we still need not despair. We know a little story about Mahomet and the mountain; and every schoolboy will tell us that if there is not sufficient wind to raise the kite, it may be raised by running and towing it along by the string. If we require a wind of 8 miles per hour to raise a kite, by towing at that rate in a calm it will be taken up. Of course, we cannot

rely on towing our kite if we wish to send it miles away over the heads of the enemy; but in this way it can be raised into an upper current of air, and I believe the occasions would be very rare indeed when there is not sufficient wind to support the kite, at a height of, say, 500 feet. I have again and again tried on days when there seemed to be *no* wind, *running* my kite up, and once I have got it several hundred feet up it has nearly always flown well and strongly. As for large kites, I have on several occasions, when too calm for the kite to rise at all, got it towed along by a dozen men running, or by a horse and trap, when it has steadily risen, and carried up a man well. As a rule what is most required of an aërial observer is to report some one fact, *e.g.*, whether there are any troops behind a particular hill, &c. Therefore, it would not often be necessary to keep towing the kite for any long time.

So much, then, for the objection of possible lack of wind. And what other objections can be brought forward? I have already shown that if the ropes break, or even if the frame becomes damaged, the kite will form a parachute and descend gently. I believe I have quite overcome, as regards the man-carrying apparatus, any tendency to "dive" or turn over. I now only await your decision. Doubtless there are many holes to pick in the theories I have here set up, and I hope you will pick them well. I am really anxious to know whether you will (like some of my early kites) dash my hopes to pieces, or whether you will own that this much-neglected, but well-known, apparatus is likely to be the means of increasing the efficiency of our forces in war.

Lieutenant R. B. D. BLAKENEY, R.E.: I think, Sir, as the only officer of the Balloon Section here present, that the great objection to the use of kites is the very small factor of safety in their use. I have seen a good many kites flown, but have not yet come across one that did not look as if it would come down to the ground with a crash, supposing that anything untoward were to happen. Mr. Baden-Powell says that he has got over that difficulty, but as far as my experience goes there has always been that danger. If one of the side lines were to break, I think it very likely that the whole balance of the kite would be upset, and that it would come down. The second great objection is that it is very difficult to get a tackle which is light and withal strong enough to hold the kite. Those who have tried to tow a balloon across country can recognise the tremendous force of a high wind, and with a large area, such as a kite affords, the objection would be still more marked. I cannot agree with the lecturer when he says that he thinks that the time will come when kites will supersede balloons, but the kite may prove a very valuable auxiliary to a balloon. This year we will try a combination of the two, and when we do I hope that he will come down and assist with his experience. There are days in the year when a balloon with its much greater factor of safety, and its means of rapidly getting up into the air, would have to be used in preference, even in a close country. But if, after the matter had been thoroughly investigated, a kite were carried with a balloon section in the field, then a very valuable aid to aërial observation might be obtained. As regards the transport, that certainly offers very great advantages over that of balloons, although with the new equipments now being brought out, a war balloon of 10,000 cubic feet will only require two tube wagons instead of four, and it is hoped still further to reduce the weights of the balloon wagon so as to enable us to work with a pair of horses therein. As for a man firing from a car attached to a kite, I do not know whether that would be feasible. It is said that a kite is

steady in a high wind, but I have never yet seen one up in the air without a certain amount of motion, which would influence shooting very materially, in addition to which the fire would be of a plunging instead of a grazing nature. Regarding the question of dropping explosives and communicating with besieged towns from kites, that I think could be worked, and hope to see experiments of this nature carried out. But as to escaping from invested towns, if we consider the very limited space in which to start the kites, as well as the long distance from the city of the lines of investment, it seems to me that there would be a very small chance of a free kite dropping out of reach of the enemy, even if it did parachute without accident. Not much has been said about the form of kite to be used, but Captain Pilcher is here, and I hope that he will give us some of the results of his experiments. I saw his kite flying last year. He used a small kite with which to raise a series of discs placed one over the other, and the whole arrangement seemed steady; but the great difficulty of the tackle came in, and eventually it broke away. That could be got over if future experimenters would take up these inventions and work them out; but until we have found by experiments some species of kite which will get up into the air and stay there safely, you cannot expect a man to go up to a height of 500 feet and remain there with anything like a quiet mind, when he knows that should the wind drop the kite will dive and come down with a run; and a kite would do this, I believe, for the wind is always varying, and if you watch a captive balloon working you will notice how it goes up and down according to the force of the gusts. Nor can I bear out the statement that the wind is faster at great altitudes than near the earth. I quite admit that at 100 or 150 feet it is so, but often at 500 feet it is stronger than at 1,000 feet, and so on. The lecturer deserves the best thanks of all concerned for bringing this matter into prominence, and I sincerely hope that kites will have a great future before them, but as auxiliaries to the present system—they will not supplant it.

CAPTAIN T. D. PILCHER (Northumberland Fusiliers): Last year I made a good many experiments with kites. The kite I worked with was one showing two convex surfaces; it was about 6 feet long, and about 2 feet from the top was a cross-bar also 6 feet. I got kites made on this principle to fly without a tail at an angle of 85°. I first of all tried a string of these kites, but I found that there was great difficulty in getting them up. The matter was very much simplified by having one kite at the top, and then having a series of discs, something like children's hoops, but lighter and stronger for their size. The main rope passed through the centre of the canvas of these discs, and they were attached by small strings from the hoop itself to the main rope. These discs increased the pull out of all proportion to the extra canvas used. I sometimes had as many as eight or ten of these discs up; the kite which was sent up alone had to lift the weight of the tackle up to the first hoop, and including this hoop, the kite and the first hoop were responsible for the weight up to and including the second hoop and so on. This is a matter of importance, as the extra weight affects the angle at which the system of kites fly, and it is necessary that it should fly at as high an angle as possible, because, for instance, when flying at an angle of 85°, pretty nearly the whole of the pull is lifting power, which is not at all the case when flying at the angle of 45°. I got such a system of kites and hoops to pull very hard indeed, even pulling along a section of men, and breaking a rope tested to bear a strain of 8 cwt. They once took away the whole of the telegraph wires between the Farnborough Road and London, and altogether smashed a good many things about that part of the country. As I say, I made a great many experiments with them during last summer, and thought over the matter to a certain extent during the winter, and I have come to the conclusion that there is not much in it. First of all, compared with balloons, kites are cumbersome to get up; and secondly, you are never sure how much wind you are going to have. Wind often rises or drops within the

course of an hour or two. I have often started with a nice wind, and after getting the whole of my system up I have found the wind has dropped. Mr. Blakeney has often helped me. Sometimes after getting the system up, the wind increased, and we found our tackle was not strong enough, whereas if we had started with heavier hoops and line the system would not have flown in the lighter wind. The weight increases out of all proportion to the expanse of canvas you use. For instance, you can make a small kite of, say, 5 feet area, proportionally very much lighter than a kite of 25 feet area. The heavier your gear is the more force is expended in lifting it, and the smaller is the force you have over for lifting yourself and your basket. As far as transport is concerned, I think it would be necessary to take eight or ten times as many kites as you wanted, because so many of them break.

CAPTAIN J. E. PHILLIPS, R.E.: I have had a certain amount of experience in ballooning in former years, and there are many occasions when a balloon cannot be used on account of the wind being too strong. On one windy day when the lecturer was present I went up, and from a height of 400 to 500 feet the balloon bumped violently on the ground and repeated this several times, making it impossible to do any observing that day. I am of opinion that kites will not in any way supersede balloons, but that a thoroughly reliable kite will be extremely useful on occasions when a balloon could not be used, that is, when the wind is too strong for a captive balloon. I do not agree with the lecturer when he proposes to supersede balloons altogether, and in calm weather or comparatively light winds to tow the kite. I think this would be a mistake and present practical difficulties in an enclosed or rough country. It will probably be found advantageous to use balloons in light weather, and kites when there is much wind. The great difficulty which has been experienced with kites has been the danger, as explained by the lecturer, that they are liable to tilt up and fall down. For myself, I must confess that I had been very doubtful whether a safe kite could be made until I had the pleasure of seeing the lecturer's kite last year. I was most favourably impressed with it, and his experiments so far have, in a great measure, reduced the liability of the kite to tilt up and fall down. It is not, as the lecturer agrees, anything like perfect as yet, but with further experiments it may become so. Some safe system of kite, whether it be in the style of the lecturer's, with several side ropes to prevent it tilting up, or designed on the lines of Mr. Hargreave's cellular kite, would, I am sure, prove an efficient substitute for a balloon in a high wind. I think it is drawing too much upon one's imagination, when one foresees the possibility of sending up men to shoot from kites, or anything of that sort. What is really required is a safe kite for observing purposes. There is no doubt that kites can be applied usefully to carrying ropes across rivers, etc.

Mr. BRUCE: I think Mr. Baden-Powell, in his very interesting paper, somewhat underestimates the possibility of using balloons in windy weather. I happen to have had a very large experience in using captive balloons in windy weather in the course of the signalling experiments that I have conducted for several governments and also privately, and I should like to quote you some figures referring to one occasion when I carried out my experiments successfully in spite of the wind, viz., July 7th, 1892. These figures were given to me by the Astronomer Royal, of the Royal Observatory, Greenwich. The experiments took place in the Stamford Bridge Grounds. From 9 to 10 p.m., when we were filling the balloon, the direction was W.S.W., pressure ¼ to 1½ lb. generally, with a gust of 2·6 lbs., velocity 19 miles. From 10 to 11, about the time the balloon went up for the experiments, the wind was in the same direction, the pressure 1 to 2½ lbs., with one gust to 3½ lbs., and velocity 26 miles. I think those who have worked captive balloons will agree that that is a very high velocity for captive balloon work. I happen to know the signals were seen at a distance of six miles; in spite of the wind the balloon remained up from 1 to 1½ hours.

I had to use a great number of guy ropes, and certainly had very great difficulty that night, but I managed to carry out the experiments all the same. Of course, it is much more easy in the case of a balloon that does not take up observers to carry out experiments in windy weather. I may further add that in a period of 2½ years I fixed thirteen occasions in advance to send up a balloon, and was enabled to carry out the experiments on each occasion. I think that shows that a captive balloon, at any rate for signalling purposes, can be used in a very strong wind. There is one other point Mr. Baden-Powell laid stress upon, that a balloon may be brought down by a bullet. I think it is pretty well proved both in this country and on the Continent that it is very difficult to bring a balloon down with bullets. A balloon is likely to be hit in the under part, and being hit in the under part it may be pretty well riddled with bullets before the balloon can come down. Also, as to the balloon being more easily set fire to than a kite, I cannot quite see why it should. If it is a case of being struck by lightning, a kite might as easily be struck by lightning as a balloon. I also do not quite see the point of the ascent and descent of the kite being more easily managed by the man in the car than in the case of a balloon. The man in the car of a balloon usually has the control of the vertical movement of the balloon.

CAPTAIN PILCHER (Northumberland Fusiliers): I should like, if I may be allowed, to add another word. The discs I used undoubtedly gave very great steadiness to the system of kites, and prevented all tendency to dive. When I said I did not believe in kites, I meant for observation purposes. I myself was lifted involuntarily to a height of 40 or 50 feet last year. I was holding on to the rope which was fastened to an oak post, when the men below me who were holding the rope down let go, and up I went. A man jumped at my leg and tried to pull me down, but fortunately missed me. I entirely believe in kites for signalling. The way I tried this last year was to get two big baskets in the shape of cylinders, and to put them on to the rope; when I had a kite flying at a very high angle, I attached the two baskets together with strong pieces of elastic, pulled them apart, and made dots and dashes in that way. This signalling was visible for several miles. Moreover, one can either by weights underneath them, or by putting a small sail on one side, always keep one particular side of the basket in the direction in which you wish to signal. This side should be of a dark colour, which will show up against the sky, and the rest of the basket of a neutral tint. My brother, who used to help me conduct my experiments last year, showed me the other day a new kind of kite which he has got, which, he says, has very much greater lifting power in proportion to its weight than anything else he has seen. It is made of light metal like a box with the top and bottom knocked out. It is the invention of a gentleman residing in Australia.

The CHAIRMAN: Mr. Bruce, can you tell me if you have ever tried signalling with balloons by means of the electric light?

Mr. BRUCE: That is my system.

The CHAIRMAN: I thought you might be able to do it also with a kite.

Mr. BRUCE: There is no doubt you can put the apparatus on to a kite. I was very nearly considering doing so. I tried some experiments with kites with Mr. Douglas Archibald. He wanted me to combine kites and balloons together. He made me a very large kite, 18 feet in diameter, to go with an 18-foot balloon. The idea was to combine the two. Practically, I rather abandoned the idea in favour of a very large use of guy ropes, and I found my experiments exceedingly successful in thus working balloons in windy weather. I think that a further experiment with a combined kite and balloon would be useful. Of course, the kite would rather tend to damage the balloon if used in combination.

Lieutenant B. BADEN-POWELL, in reply, said: Mr. Blakeney has picked a lot of holes in my paper. I asked the audience to pick as many holes as they could,

and I think Mr. Blakeney has done it right well. First of all, he says the kite looks as if it was unsafe. I am sorry if it looks like it, but I am afraid I cannot help the looks of it. I believe myself that it is quite safe. Then he says the tackle is apt to be very weak. I cannot say myself, from my experiments, I have found the tackle apt to be weak. I have very seldom broken any ropes, except that I did try some experiments originally with a very badly made rope, and it broke on several occasions, but since I have had good ropes I have hardly ever broken them. There was one occasion only, the other day, when I found a very calm day below, but I got my kite up to a considerable height, and the pull then became so enormous that finally the cord, which was supposed to stand a strain of 400 lbs., broke with three small kites attached to it. As long as the kite will raise itself at all it is always capable of carrying up a good amount of rope. Several speakers have mentioned a combination of kite and balloon. This has been suggested on several occasions in former years by various inventors, but it always seems to me that there are many objections to having both the kite and balloon combined, and very few advantages, that is to say, the only advantage gained over an ordinary balloon in the kite portion is of assistance in very windy weather. In calm weather it is only an encumbrance to the balloon. There is the same objection of having to carry about gas, and all the objections that you have to the use of the captive balloon. Then Mr. Blakeney said he had never seen a kite kept steady from shooting down. I think I may say that my system, as roughly represented in these drawings, when properly worked (though, of course, I have now and then had accidents from different causes), as a system is such that, I believe, it is quite impossible for a kite to turn over and shoot to the ground. It seems to be always held perfectly steadily. As to the form of the kite, I have said very little about it, and my chief reason for not having done so is that I am in great doubt at the present moment as to which is really the best form. I have tried a great many shapes. This one here represents about the last form I have tried. I do not say it is perfect, or even that it is necessarily much better than a good many others I have tried formerly, and therefore I feel I am not quite competent to express an opinion as to what really is the best shape of a kite. Mr. Blakeney says he hopes the matter will be gone into. Of course, I do not profess to say that my apparatus is perfect, or think that the subject is in any way fully developed—it is just that which I am anxious to see done. Mr. Blakeney says the records of balloon ascents do not show that the wind above is faster than it is below. I rather beg to differ with him there, because it so happens I collected together only recently a number of statistics to find the average rate at which a balloon travels. A balloon very seldom goes up in rough weather; and, although I have not got the statistics by me at the present moment, I can assure you the average rate at which balloons travel is infinitely greater than that of the average wind force at the surface of the earth.[1] Mr. Douglas Archibald, whose name has been quoted,

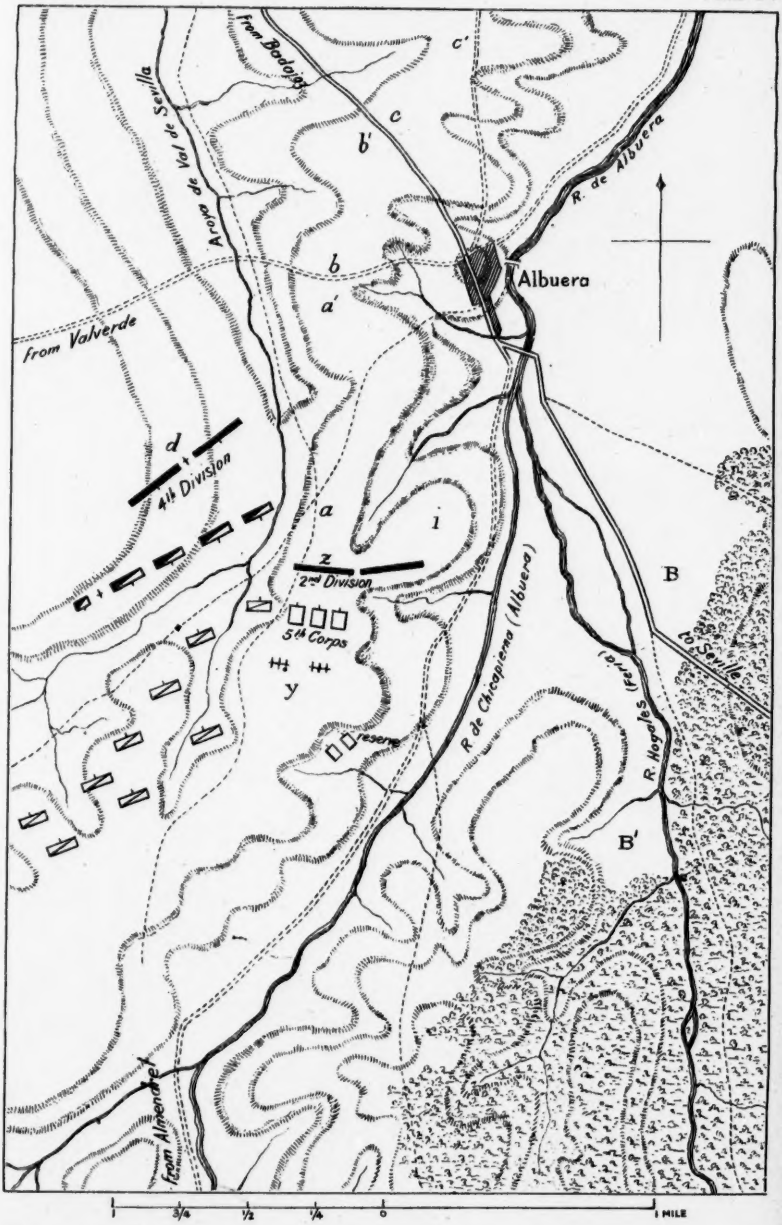
[1] The following extracts will prove what I said. In summarising all his balloon ascents, Mr. Glaisher ("Travels in the Air," p. 90) says, "Simply taking into account the plans of ascent and descent, the distances thus measured were *always very much greater* than the horizontal movement of the air as measured by anemometers." M. G. Tissandier in his book "En Ballon," says, "Generally the wind increases in velocity in proportion as one mounts in the atmosphere. This rule is nearly absolute." M. Flammarion in his "Voyages Aériens" (p. 324), says, "The velocity of the air increases with the height . . . at the same time that the wind is very feeble at the surface of the earth, the clouds and the balloons travel with a mean rapidity of 21 to 34 miles per hour." Mr. D. Archibald (Report of Aër. Soc., xxii.) says, "The velocity (of the wind) *always* increases with altitude; in fact, a reverse case has never occurred within my experience." Taking at random, the records of thirty balloon ascents, I find the average rate of travel is 31 miles an hour.—B. B.-P.

read a paper some years ago before the Aëronautical Society on this subject of the wind force increasing as elevation increased, and his paper is most convincing. He shows by a number of different observations, both by balloons, kites, and anemometers, placed at different heights, that the wind invariably, or almost invariably, flows very much faster at a height above the ground. Then as to what Captain Pilcher says: He takes a number of discs, which he sends up on the string of his kite, increasing the pull. I do not quite see the object myself of the discs, because if they are of any size it seems to me that they would be very difficult things to pack away in a small space. I imagine the chief object is that of signalling, and if so, he does not require a very great power but for the purpose of lifting very heavy weights, men and so on. I think that kites might be made much more portable than these discs, in fact, in my latest arrangement I have several small kites like the two represented in the sketch. I propose trying now a great many more, perhaps half-a-dozen kites, all one behind another. Then Captain Pilcher says the kites are cumbersome things to get up. I do not agree with him at all there. I have generally found my kites, presuming there is a fair wind, are the easiest things imaginable. You just spread the canvas out on the ground, place your framework on the top of it, attach it, attach your ropes, and lift the front edge of the kite and it goes up as easily as can be. To show the ease with which this can be done, I have sent up some of these big kites, 500 square feet, entirely by myself without any assistance whatever. That shows there ought to be no very great difficulty about getting the kites up when properly managed. Then he mentioned about the wind suddenly dropping. Although the wind very often drops slightly, and I have known kites on several occasions when flying gradually begin to settle down, still it never drops so suddenly as to be in any way dangerous to a man lifted with it. It always goes down gradually. He speaks of transport not being so simple as I make out, because he says you would have to take a lot of extra kites in the event of a smash. I rather imagine I should eventually get my apparatus so that it would not smash, and, therefore, I should only require to carry a given number of kites sufficient for my object, perhaps taking one or two extra ones if small kites in case of any accident. Captain Phillips is one who has seen the apparatus in actual working order, although he saw rather an early form of it, and did not see it on a very suitable day. He mentions that he thinks kites would be used as an auxiliary, and he thinks it a mistake to tow kites in calm weather. I do not quite see why it should be a mistake to tow them, considering their advantage over balloons. I think myself they might do very well in calm weather if they were towed. Then, as to what Mr. Bruce has said with regard to captive balloons in windy weather: his chief argument is to prove that one of these objections which I raised to captive balloons, viz., that they are very dependent on not having too strong a wind, is not really an objection to their use. He says that, having made experiments at Stamford Bridge Grounds, when there was a strong wind blowing, that the signals were seen six miles off, and so on. I had the honour of being present on that occasion, and I saw the captive balloon going up. Although it may have been possible that the lights were seen six miles, as the balloon went up several times to a good height, I should have been very sorry indeed to have been in that balloon. All I can say is, it was blown about tremendously, and several times banged very hard on the ground. As to the signals being seen, I should like to ask Mr. Bruce whether the signals were *read*. People at a good distance might have seen the balloon go up, and seen a flash or two before it came down, but I should have thought, from what I saw, it was very seldom that a single letter could have been read—certainly not a united word—because the balloon was moving about so much. And after all, if it is proved that a captive balloon can be sent up in a strong wind for signalling purposes, I do not quite see where the advantage of a captive balloon comes in over a kite. Then he says, with

reference to a bullet bringing down a balloon, it has been proved that a bullet going through a balloon does not bring it down. I know as a fact that when a balloon is pierced by a bullet it comes down very slowly, so that a man in the car would not have been damaged. But I think, nevertheless, the gas in that balloon is bound to come out, and even though it may last an hour or so, yet the whole of that fill of gas is bound to go within some time, it may be longer or shorter. Mr. Bruce referred to the setting on fire of a balloon, and he said a kite would be as easily struck by lightning as a balloon. I happened to be present on the occasion at Aldershot when the balloon was struck by lightning. The apparatus, so far as I could see, the ropes, car, and so on, appeared not to be in the least damaged. The only thing that appeared to be really damaged was the balloon itself. Apparently, the lightning set the gas on fire. The gas at once flamed and burned the material, and the balloon fell like a stone. If it had been a kite, I should imagine that it would have been absolutely unharmed. Whether the man in the car of the kite would have suffered from the shock or not, I cannot say. I should rather imagine that he would not. Then, about the ascent and descent. In a captive balloon, if you are making a number of ascents, going up and down, it would be impossible every time you want to come down to let out gas, and every time you wanted to go up to let out ballast, because you would have to carry up such an enormous quantity of ballast, and yet you would want to take as little gas as possible. With my kite I am able to alter the angle when in the air in such a way that the power of the kite is taken out of it, and it sinks as gently or rapidly as you like, so that the man in the car is able to control the kite and let it go up or down. In the captive balloon, in the ordinary course of events, you are hauled down by manual labour, which requires a great amount of power. Captain Middleton mentioned the Chinese or Japanese cutting the string of a line of kites going to a besieged city. Of course, that might be possible. I am not prepared to say, never having actually tried much about that; but at the same time if it was a strong wire—and I don't see why a very thick wire should not be taken up—it would be a difficult thing to cut it through with the string of another kite. That is all I have to say, except to thank you for the attention you have given to my paper.

The CHAIRMAN (Lord Methuen): Ladies and gentlemen,—Kites, at any rate, have had a very good counsel in their defence in Mr. Baden-Powell; whether the witnesses called also in their defence have been so good and reliable, I must leave you to judge. It is always a difficult thing to say the jury is not in favour of any invention. There are a good many of us who, some years ago, had we been asked if we thought cycles would be likely to be of any very great value to an army would have given a negative answer. I, at any rate, would have given one myself, but I have lived to see cycles of value. So it may be with kites, but at present I cannot say that I see there is anything that we have heard this afternoon to lead us to suppose that they have the first requisite, which is safety. I went down to the home of kites, where their creator, Mr. Baden-Powell, resided, namely, at Pirbright. He had it then perfectly in his power to convince me, knowing that I should be chairman here this afternoon, as to the safety of the kite. He told me that he had persuaded an officer—let me remark that it was the youngest, the lightest, and junior officer of the regiment—to essay an ascent in the kite. Mr. Baden-Powell was there; it was perfectly within his power to satisfy me as to its safety by at once ascending. There was a feeling of satisfaction amongst some of those officers junior to him, and it seemed to me that the feeling of promotion perhaps for the moment superseded the great feeling of friendship that they had towards their brother officer. They looked to him as much as to say, "*It is now your duty to go up*," and so far, I thought perhaps Mr. Baden-Powell was alone to blame for not satisfying my very legitimate curiosity. His commanding officer, however, said to me with a good deal of sense, "Baden-Powell don't go up in the kite till he has finished his instruction in

my reconnaissance class." Now Mr. Baden-Powell has, I believe, finished his instruction in the reconnaissance class, and if he will satisfy me by ascending to a height in the air, where he tells me the wind is more rapid than it is nearer the earth, I shall be only too glad to go down to see the venture, and then I shall be satisfied that there is more safety in the kite than I believe at present exists. But this Institution, if it has any claim on the Army and Navy, and it has very great claim, has none so great as this, that every fad and every invention can be brought forward here by military and naval officers alike; that they can put forward their inventions, they can have them discussed by naval, military, and civilian alike, and that they will get a good and patient hearing; and many an invention, which is quite in its childhood, has gained its existence simply from being well argued in institutions such as this. It is for that reason that I have extreme pleasure to-day in presiding and in thanking Mr. Baden-Powell for the excellent lecture he has given; and if I have simply spoken out the plain truth with regard to my opinion about kites at present, I in no way mean to say that I think that in another ten years I may not have to alter it when they have been improved upon by Mr. Baden-Powell and others. There are very few inventions that we have seen that have not been started in this way, and improved and improved upon until we have recognised that our first opinion of them was not correct.



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THE BATTLE OF ALBUERA.

By Lieut.-Colonel E. M. LLOYD, R.E. (Retired).

THERE is no battle in which the fighting quality of British infantry, and their ability to pull their general out of a hole, is better shown than that of Albuera, and there is none which has been described in more glowing and soul-stirring language. But the artistic excellence of Napier's picture impairs to some extent its scientific usefulness, and when we study the battle for the sake of the light it throws on the tactical value of line and column, we feel the want of those exact and minute details to which the German histories of the war of 1870 have accustomed us.

Among the "various opponents" brought into the field by Napier's outspokenness, Lord Beresford was the most prominent. He was especially sore at Napier's treatment of him in relation to this battle, and a great many particulars about it are to be gleaned from the controversy between them.[1] The main question at issue, how much praise or blame was due to Beresford, is one which it is not worth while now to meddle with. But Beresford challenged Napier's facts as well as his criticisms, and each of them appealed to prominent actors in the battle. For those who have neither time nor inclination to disinter long-buried quarrels it may be useful to collect here so much of the evidence brought forward as bears upon the main action, and either modifies or supplements Napier's account.

His description suggests bolder features of ground than it actually presents, for, according to D'Urban, "it was of gentle undulation and easy for cavalry throughout." And though he mentions that the battle lasted six hours, and the serious fighting four hours, it requires an effort to remember this as we are carried along by the impetuosity of his style.

The strength of the two armies was a much-debated point, and cannot be determined with any accuracy. Lord Londonderry (who was Wellington's Adjutant-General) had put the total of the allies at 27,000 as a maximum.[2] Napier put it at more than 32,000, and afterwards thought he had understated it. For the present purpose we need only examine

[1] The following are the pamphlets in which it was carried on:—(1) "Further strictures on those parts of Colonel Napier's 'History of the Peninsular War' which relate to the military opinions and conduct of General Lord Viscount Beresford," 1832. This was anonymous, but Beresford afterwards virtually acknowledged himself to be the author (2) "Report of the operations . . . . under Sir W. C. Beresford . . . . during the campaign of 1811, by Major-General Sir Benjamin D'Urban." This had been written much earlier, but was reprinted as an appendix to (1). D'Urban had been Quartermaster-General under Beresford, and was his chief supporter in the controversy. (3) "Colonel Napier's justification of his third volume . . . . containing some new and curious facts relative to the battle of Albuera," 1833. (4) "Refutation of Colonel Napier's justification of his third volume by General Lord Viscount Beresford," 1834. (5) "A letter to General Lord Viscount Beresford," in answer to the above, by Colonel Napier, 1834.

[2] "Narrative of the Peninsular War," ii., 131.

the strength of the British infantry. Napier speaks of this in one place as 6,000,[1] in another place as not exceeding 7,000[2]. In his Justification (p. 21) he gave as his authority Lord Londonderry's estimate of the British as 7,500. But Lord Londonderry says[3] that "out of 7,500 British troops engaged, 4,158 were placed *hors de combat*," and the returns in his appendix show that the latter figures included not only the cavalry, but the two battalions of the King's German Legion. The latter numbered 1,100 men, according to Alten, who commanded them;[4] and the British cavalry (3rd Dragoon Guards, 4th Dragoons, and 13th Light Dragoons) seems to have amounted to at least 900 men.[5] Deducting these, we have only 5,500 for the British infantry. Confirmation of this is furnished by Napier himself, for he speaks of "1,800 unwounded men, the remnant of 6,000 unconquerable British soldiers." But the loss of the British infantry in killed, wounded, and missing was not 4,200; it was 3,542 if we take rank and file only, or 3,933, including officers.

As regards the French numbers, Napier stated them as 19,000 infantry and 4,000 cavalry. He afterwards found, in a report from Soult to Berthier, 12 days before the battle, what he considered to be positive evidence that he had overrated them by 1,500 men.[6] However, he left his own figures unchanged in later editions; and they seem as likely to be under the mark as over it. Soult's reports are little to be trusted.

The allies were inferior to the French both in numbers and weight of guns. Out of 38 only 10 (not 18) were 9-pounders;[7] and at the decisive point they seem to have had only 16 guns to oppose 34.

We need not dwell on the preliminaries of the battle. On the morning of 16th May the allied army was in position, holding about three miles of the ridge which runs north from Almendral, with the Albuera rivulet in its front. The second British division (Stewart's) was in the centre (*bb'*), between the Valverde and Badajoz roads; the Spaniards on the right (*aa'*), and the Portuguese on the left.[8] The village of Albuera, half-a-mile in front of the right centre, was held as an advanced post. Behind it, at *b*, immediately to the north of the Valverde road, there was a

[1] "English battles and sieges in the Peninsula," p. 117.

[2] Idem, p. 110.

[3] Idem, p. 138.

[4] Refutation, p. 114.

[5] Lumley reckoned them at something less; but eight days before the battle the morning state of these three regiments showed 1,109 troopers present under arms (Letter, pp. 25 and 32).

[6] Letter, p. 28.

[7] Letter, p. 26.

[8] The plan is taken, so far as the features of the ground are concerned, from a reconnaissance sketch by Captains Solis and Burriel, of the Spanish staff, published in *La Asamblea del ejercito* for 1858. Unfortunately, the contours are not figured. The letters used to mark the position of the troops correspond with those in the plan attached to D'Urban's report. This was prepared by Major (afterwards Sir T. L.) Mitchell, and is from the same original as that published by Faden in August, 1811; though corrected in some points and softened in the hill-shading.

conical hill which was the highest point of the ridge,[1] and was regarded as the key of the position.

The right, *aa'*, was commanded by the height *z*,[2] which became eventually the battle-ground; but the end, *i*, of the spur which runs eastward from *z* is described by Beresford[3] as a round hill considerably lower than the ridge itself. On this hill three Spanish battalions were placed in the early morning as part of the original order of battle. To the south of the height *z* there was "a deepish valley of about 400 or 500 yards in breadth," separating it from the hill *y*, and the continuation of the ridge, which rises towards Almendral.

At 9 a.m. two brigades—one British and one Portuguese—of the 4th (Cole's) Division reached the field of battle. The French were then just opening their attack. They had hitherto been concealed by the woods, and part of their infantry had only come up in the middle of the night, having marched 8 leagues. Godinot's brigade of 4,000 men[4], accompanied by ten guns and some light cavalry, and followed by Werlé's brigade of about the same strength, advanced from the south-east upon the village of Albuera (*B*). Soon afterwards the 5th Corps, which was massed behind a spur at *B'*, crossed the stream 2 miles above the village, and mounted the slope of the ridge beyond the right of the allies.

The two divisions of the corps were formed one behind the other in close columns of battalions. They were accompanied by the bulk of the artillery, which was planted on the hill *y*. The heavy cavalry were on their left flank, and were soon joined by some of the light cavalry, making 3,500 horsemen in all. Werlé's brigade, changing its direction, followed after them as a reserve (with the exception of one battalion), and the rest of the guns were brought up, leaving only one battery of horse artillery with Godinot.[5] In half-an-hour, as Napier says, or nearly an hour, as Beresford reckons it,[6] the great mass of the French army was established on the ridge upon Beresford's right, and hoped to roll up the allies, to cut off their retreat by the Valverde road, and throw them back on Badajoz.

To meet this flank attack, Beresford, on the first symptoms of it, told the Spanish general, Blake, to form his front line upon *z*, at right angles to his original line, extending his left along the spur towards the river, and drawing men, if need be, from his second line, the remainder of which would take up the ground left by the first line.[7] Stewart's division was ordered to form the second line of the new position, and was itself replaced by the Portuguese. Cole's division, which was in column on

[1] Further Strictures, p. 115.

[2] D'Urban, Report, p. 31.

[3] Further Strictures, p. 114.

[4] Justification, p. 23.

[5] Lapène, "Conquête de l'Andalousie," p. 154-6. He was an artillery officer, and belonged to the 2nd Division of the 5th Corps.

[6] Further Strictures, p. 131. Thiers speaks of an hour of inaction after the stream was crossed.

[7] In Beresford's report it was stated by mistake that the new front was to be formed by part of the first and all the second line of Spaniards, and Napier followed this (Refutation, p. 151).

the Badajoz road, was placed obliquely in rear of the right at *d*, to form a reserve for the right and centre, cover the right flank and the Valverde road, and support the cavalry on this flank. This cavalry consisted of about 1,500 men, half British, half Spanish,[1] with four 6-pounders, R.H.A., drawn up behind the Aroya de Valdesevilla, which was dry or nearly so at the time, but had worn a deep channel.

Owing to Blake's delay, Beresford had to form up the Spanish troops himself on the new front "in a much more hurried manner than was desirable," and partly under the fire of the enemy's sharpshooters.[2] But he denied Napier's statement that he could not get the Spaniards sufficiently forward to make room for Stewart's division to support them. He says the Spanish line was on the very brow of the ridge, and "had it gone another yard to the front, it must have gone down the steep of the hill." The French came fiercely on in three strong columns, but halted immediately below the Spanish line, and nearly at the foot of the steep descent upon which it was placed; and in spite of their fire, and that of the guns on the hill behind them, "the Spanish line stood with great firmness more than an hour-and-a-half." Then the Spaniards, having lost about 1,500 men, began to crowd in groups behind each other, and he ordered up the second line.[3] This second line had been formed up in rear for some time, and had by mistake fired upon the first line, while Beresford himself was between the two.[4]

Napier's account, as it originally stood, was that the French attack "put the Spaniards in disorder at all points; in a short time, the latter gave way." In its later form it is rather less definite: "the Spaniards, falling fast, drew back."[5] In his Justification he said (p. 32): "The story of the Spanish resistance is a Spanish romance."

The evidence for it, confirmed as it is by Inglis, who commanded the 57th, is too good to be dismissed in this summary way, and four hours of hard fighting have somehow to be accounted for. But this evidence applies only to the left or centre of the line, where Beresford himself was. On the right the French were more successful. Lapène says that on the first attack the right of the allies was drawn back in some disorder, and four regiments of cavalry were sent forward to charge it. D'Urban's account is that "the Spaniards made a gallant and obstinate resistance, but were at length obliged to yield their ground upon which the enemy took post," commanding the right of the position.[6] This was at an early stage of the battle, before Stewart's division had come up. The head of it (Colborne's brigade) arrived immediately afterwards, and at once attacked to recover the ground.

But if the French reached the top of the height, they did not

[1] Refutation, p. 128, and Letter, p. 32.
[2] Further Strictures, p. 155.
[3] Further Strictures, pp. 155-58.
[4] Refutation, p. 213.
[5] English Battles, etc., p. 113.
[6] Report, p. 30. Beresford said the same in his original report, though he afterwards thought otherwise.

remain there. Hardinge says:—"The first brigade (Colborne's) when they had gained the crest of the hill, found it so hot that Stewart ordered a charge, which the Buffs and 48th alone made in line against the enemy's column of at least 10,000 men. Fortunately the 31st, being the left regiment, had not had time to deploy when the two other regiments charged;[1] it therefore held the ground while Houghton's brigade deployed in the rear, and under cover, and moved up to the support of the 31st."[2] D'Urban attributes the disaster which befel Colborne's brigade (except the 31st), from the sudden charge of the French light cavalry on its right rear, not to its delay in deploying (as Napier does), but to Stewart's refusal of Colborne's request that the right wing of one regiment should be kept in column.[3] The result was not only the destruction of the brigade, but the temporary capture of six guns.

Houghton's brigade—the third brigade of Stewart's division—was composed of the 29th, 57th, and 48th (first battalion). Inglis, colonel of the 57th, says:—"The whole division moved from its ground in open column of companies right in front, about a mile, where the line was to be formed on the leading company. At this period the Spaniards were warmly engaged with the enemy, and were behaving most gallantly. General Stewart's division was brought up to support them and to form the second line. After the 29th and the right wing of the 57th formed, a body of French lancers got between the two lines."[4] These were some of the lancers who had been making havoc with Colborne's brigade, and one of them now assailed Beresford himself. A body of Spaniards who had given way and were being followed by these lancers tried to break through the ranks of the 29th. That regiment was obliged to throw back two companies to guard its right flank and to open fire on Spaniards and lancers alike. The latter were soon driven off, and the Spaniards were then allowed to pass to the rear.[5] The fire begun upon the right, travelled along the line, and was taken up by the 57th, in front of whom the Spaniards were still holding their ground; but the latter (Inglis says) did not suffer from this fire, as, owing to their position on the hill, the balls passed over their heads.[6]

When the Spaniards gave way here also Houghton's brigade, now fully deployed, was ordered up to relieve the 31st. Abercrombie's brigade (the second), consisting of the 28th, 34th, and 39th regiments came up on the left of it.[7] Inglis says:—"The Spaniards retired very rapidly, and when our front was clear we were close to the enemy (perhaps) within 100 paces." The regiment then opened a very heavy, well-directed fire, by files from the right of companies. He adds that

[1] He overlooked the 66th, which also belonged to the brigade, and took part in the charge.

[2] Quoted by Napier (Justification, p. 29) as the version which he had adopted.

[3] Further Strictures, p. 159, footnote.

[4] Refutation, p. 213.

[5] Justification, p. 30, and Everard's "History of the 29th Regiment."

[6] Refutation, p. 213.

Beresford says they were in line (Further Strictures, p. 177), but Hardinge speaks of their deploying afterwards.

"the French never did ascend the heights or attempt it." But three-fourths of the "Die-hards," including Inglis himself, fell where they stood under the French fire.

On the extreme right the state of the battle was even more critical. Many men of the 29th had used up all their ammunition,[1] and "the enemy was enabled to lodge one of his columns, which he had constantly fed from his reserves, rather forwarder than he had hitherto done."[2] Beresford, who had by this time gone to the right, "saw how advisable it was that an attack should be made upon that flank of the enemy; and, finding several Spanish battalions in column to the rear, he exerted every mode of authority and persuasion to induce them to descend the hill and to make the desired charge." It was here that he seized a Spanish officer and dragged him to the front—an incident which Napier has put earlier in the day. Finding all in vain he sent off for a Portuguese brigade, and as it did not come he went off himself to the rear to bring up what troops he could.[3]

He was the more impatient for them because he observed that the 4th Division was in movement, and this caused him great anxiety. He had given Cole strict orders not to leave the position in which he had been placed without his special instructions. He relied on this division, in combination with Lumley's cavalry, to keep the French cavalry in check; and both at the time and afterwards he considered that its advance was an error which might have proved disastrous,[4] though he praised it in his report.

Napier ascribes the advance of Cole's division to Hardinge, who was deputy-quartermaster-general of the Portuguese Army, though only twenty-five years of age. Originally he wrote:—"Colonel Hardinge boldly ordered Cole to advance." A correspondence took place on the subject in the *United Service Magazine* (1840-1),[5] and in later editions he said that Hardinge, using Beresford's name, had *urged* Cole. But even this is not borne out by the correspondence. Sir Henry Hardinge attributed more weight to the advice which he, an officer of Beresford's staff fresh from the scene of action, vehemently pressed, than Sir Lowry Cole was willing to give it, as affecting the responsibility of the divisional general. But there was no suggestion on either side that Hardinge had represented himself as acting in any sense "by order." Cole had already sent an aide-de-camp to Beresford for instructions, but he was wounded. At length, getting no orders, and convinced of the desperate state of the battle, he took the responsibility on himself of attacking the French in flank.[6] "The movement itself," he says, "was hazardous and difficult

[1] Justification, p. 20.

[2] D'Urban's report, p. 32.

[3] Further Strictures p. 167.

[4] Refutation p. 230.

[5] It consists of eight letters from Colonel Wade (A.D.C. to Cole), Colonel Napier, Sir H. Hardinge, and Sir Lowry Cole. They were afterwards reprinted by Cole for private distribution.

[6] Hardinge times this as one and a half hours after the disaster to Colborne's brigade.

to execute without exposing the right flank of the Fusiliers to an acknowledged great superiority of cavalry, ready to take advantage of any error that might occur. In moving forward to the attack the Fusiliers advanced in echelons of battalions from the left, a manœuvre always difficult to perform correctly even in a common field-day; and as the Portuguese brigade in advancing had two objects to effect, namely, to show front to the enemy's cavalry and at the same time to preserve its distance from and cover the right flank of the Fusilier brigade, its movement was even more difficult to effect than the former. Thinking it desirable (with all due confidence in the Portuguese brigade) to have some British troops on the extreme right of the position, I directed the light companies of the Fusilier brigade to form in column on the right of the Portuguese, where I also placed the brigade of guns [Hawker's six 9-pounders], and sent the Lusitanian legion to the left of the Fusiliers."

The Fusilier brigade—7th (1st battalion), 7th (2nd battalion), 23rd (1st battalion), counting from left to right—numbered 1,500 rank and file; the Lusitanian legion about 750 light infantry; and the two regiments of Harvey's Portuguese brigade something over 2,000.[1]

Colonel Harvey, in his journal written that day, described the advance[2]:—"The 23rd and one battalion of the 7th Fusiliers were in line. The other battalion at quarter distance, forming square at every halt, to cover the right which the cavalry continued to menace. Major-General Lumley with the British cavalry was also in column of half-squadrons in rear of our right and moved with us, being too weak to advance against the enemy's cavalry." These precautions explain how the Fusiliers escaped the fate of Colborne's brigade. One attempt the French cavalry did make, and it is said that the right of the Fusiliers was partially broken, but the horsemen were driven off by a volley from the Portuguese.[3]

Hardinge says:—"The instant Cole's division was in movement and his left brigade approached the right of Houghton's, I went to Abercrombie's brigade, and authorised him to deploy and move past Houghton's left. While Houghton's brigade held the hill, Myers and Abercrombie passed the flanks on the right and left, and made a simultaneous attack on the enemy, who began to waver and then went off to the rear."[4]

How the battle looked from the French side is described by Lapène, who probably watched it from the hill *y*. After mentioning the retirement of the Spaniards on the right and the success of the French cavalry against Colborne's brigade, he says that the right was seen to be forming hastily in squares; alluding, no doubt, to the action of the 29th in throwing back two companies. This convinced both Soult and Girard (who was in temporary command of the 5th corps) that the allies meant to retreat. Girard determined to push on and attack them at once; so,

[1] Refutation, p. 120.

[2] Letter, p. 31.

[3] Cole, "Peninsular Generals," i., 286; and D'Urban, Report, p. 34.

[4] Life, by his son ("Rulers of India"), p. 22.

without waiting to deploy, he advanced with the 5th corps in close column—a fatal imprudence. This mistake and their own numbers gave the allies an incalculable advantage. Beresford moved up his second line and three reserve brigades. "They calmly open a fire from two ranks, well maintained and well aimed. Not a shot is lost in our close column, and it can only reply with the insufficient and ill-maintained fire of its two front ranks." The soldiers fell helplessly right and left, and the survivors lost heart. Girard tried to deploy and to take ground to his right, but it could not be done under such a fire—there was neither room nor calmness enough. The result of this desperate position was a pronounced wavering, which soon became a retreat in disorder. First the leading regiment gave way, having lost 600 men, then others followed in succession. The troops soon formed a confused mass, which fell back pell-mell, and only stopped on reaching their original position beyond the stream. Soult ordered up Werlé's reserve brigade to support Girard, but while the two regiments composing it were deploying they were thrown into some confusion by the fugitives of the 5th corps. Nevertheless it stood for some time, and eventually retired, after losing heavily, in better order than the 5th corps. The artillery and cavalry then retired too.

There is some discrepancy in the accounts as to the French formation. One division of the 5th corps was behind the other, and Lapène says they were *en colonnes serrées par bataillons*. The authors of the "Victoires, Conquêtes, etc., des Français," whose account in the main agrees closely with Lapène's, say that each division was *ployée en colonne serrée par régiment*.[1] Home speaks of them as in mass of close columns of double companies,[2] but that would be described as *serrée par divisions*. The accounts may be best reconciled by assuming that, as was the case with D'Erlon's corps at Waterloo, each column consisted of deployed battalions one behind another, but that the three battalions of each regiment were side by side, so that there were three contiguous columns. Both Beresford[3] and D'Urban[4] say there were three columns of attack, with 4,000 to 5,000 men in each, according to the latter: while Hardinge speaks of one column of at least 10,000 men. The regiments, as we have seen, gave way in succession from the front; which implies that the whole front was formed by one regiment. The depth of the columns on the above assumption would be twenty-four ranks, and the front of each would be about 100 yards; while the fireline of the three deployed British brigades which ultimately enveloped them would be three-quarters of a mile.

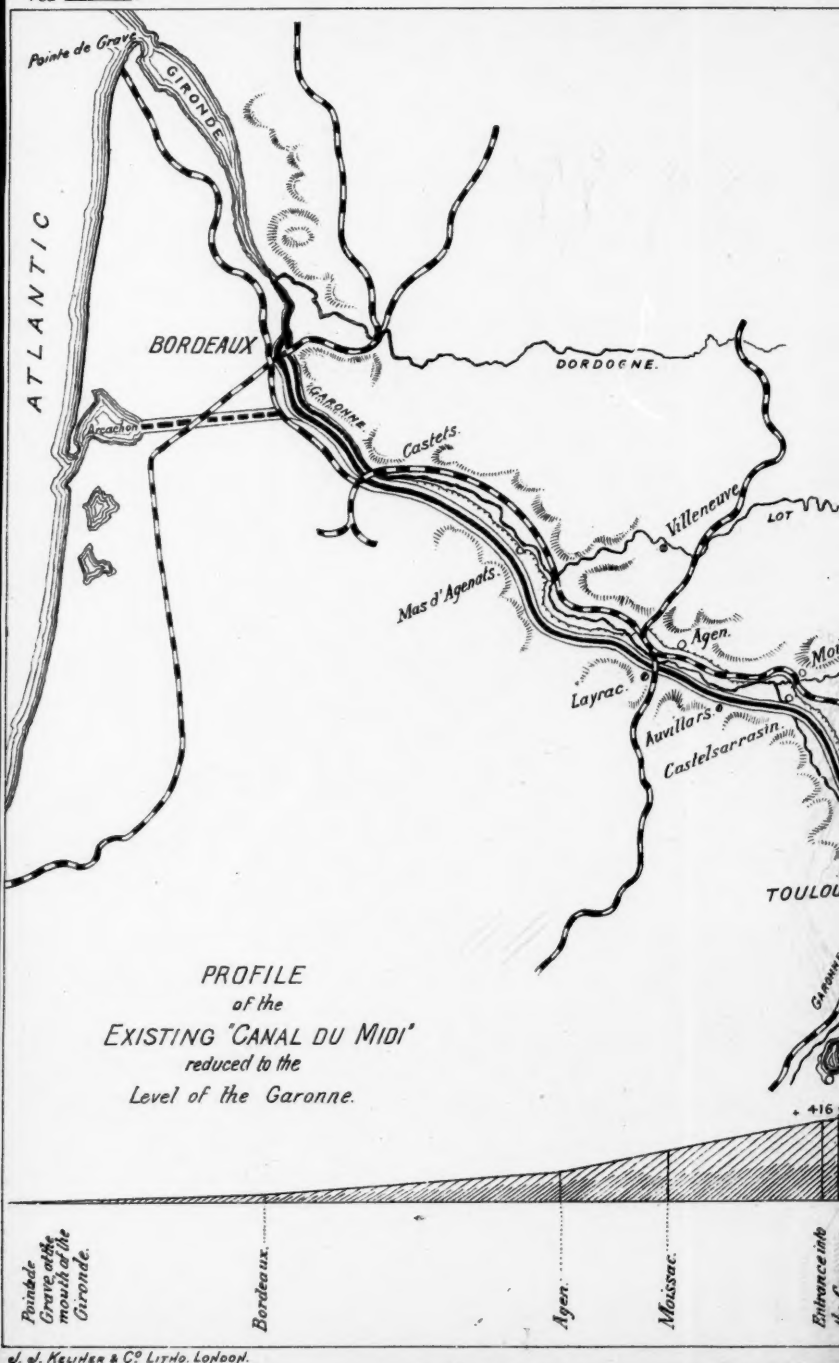
Not much is to be learnt from Soult's report.[5] With an audacity almost sublime he tells the emperor: "The enemy left us the position we had taken from him, and did not venture to attack us again." He

[1] Tome, 20, p. 236, etc.
[2] "Précis of Modern Tactics," p. 249.
[3] Further Strictures, p. 157.
[4] Report, p. 32.
[5] "Wellington Despatches," supplementary, vol. xiii., p. 651.

says he had 18,000 men, including 3,000 horse. He puts the loss of the French at 2,800, and that of the allies at nearly 10,000. Napier reckoned the French loss at more than 8,000, and there is no reason to think he overstated it. The loss of the allies was under 7,000.

The following is the return of killed, wounded, and missing in the British battalions, officers included :—

2nd Division (Stewart)	Colborne	66th	272	1413
		48th (2nd batt.)	343	
		31st	155	
		Buffs	643	
	Houghton	57th	428	1044
		48th (1st batt.)	280	
		29th	336	
	Abercrombie	28th	164	390
		34th	128	
		39th	98	
4th Division (Cole)	Myers ..	7th (1st batt.)	357	1045
		7th (2nd batt.)	349	
		23rd	339	
Three companies 60th (5th batt.) and detachments from Kemmis' brigade of the 4th division ..				41
		Total		3933



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PLAN

OF THE

"CANAL DES DEUX MERS"

1: 1,700,000.

Scale of Statute Miles

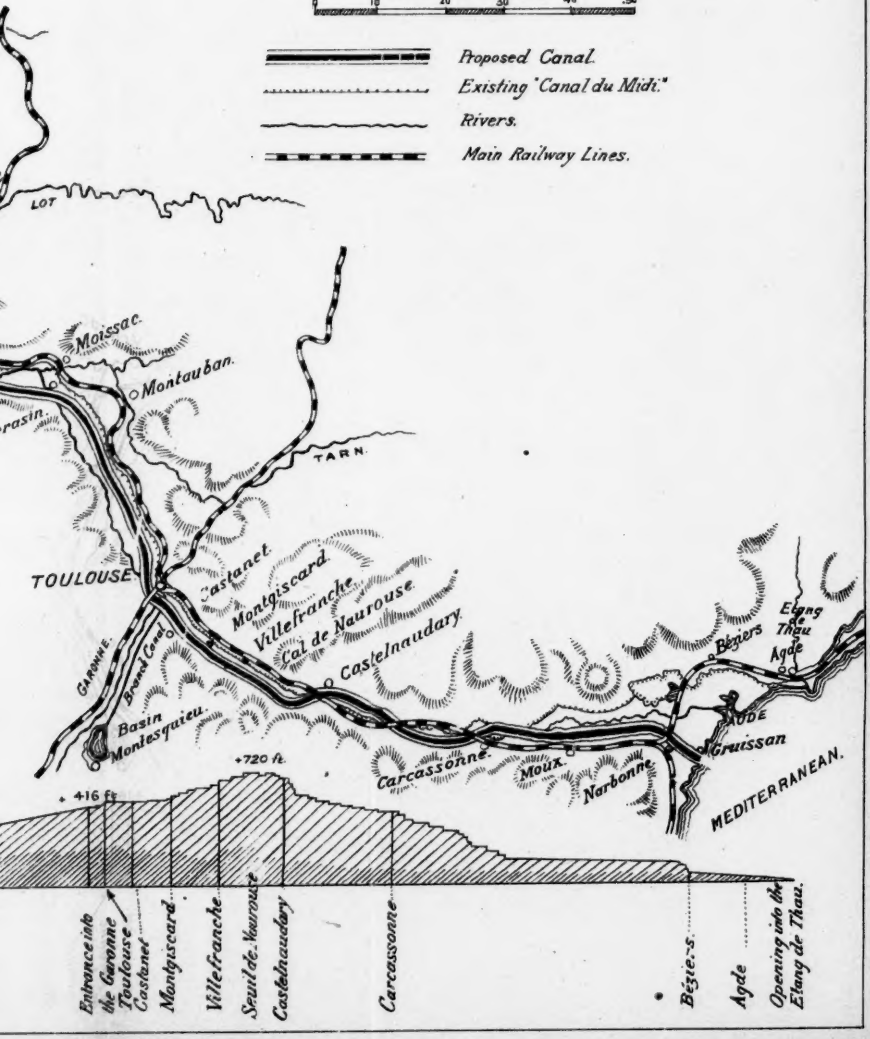
0 10 20 30 40 50

Proposed Canal.

Existing "Canal du Midi."

Rivers.

Main Railway Lines.



[*From the "Marine Rundschau" of July, 1895.*]

THE "CANAL DES DEUX MERS."

Translated with permission from the German of
Captain-Lieutenant SOUCHON, I.G.N.,

By Captain H.S.H. Prince LOUIS of BATTENBERG, R.N.

NOW that the Baltic Canal has been opened to traffic, it may not be uninteresting to hear something of another projected canal, which, if carried out, would prove of as great, if not greater, importance to France as the Baltic Canal is to Germany—that is the proposal to connect the Mediterranean with the Atlantic.

The idea of connecting these two seas by means of a maritime canal through southern France is certainly not new, but it only assumed a tangible shape about fifteen years ago. The success of the Suez Canal, as well as the execution of the Baltic Canal, may have proved an incentive.

As the length of this canal exceeds 300 miles, and a mountain pass of over 600 feet in height has to be traversed, it is evident that exhaustive preliminary works, calculations and plans would be necessary.

When the proposal, started in 1880, to make a canal with sixty-three locks, having a drop of about 16 feet each, did not meet with a favourable reception, the *Société d'études* came forward in 1884 with a scheme which only required thirty-eight locks, at a total cost of £36,000,000. The Government, however, after a close examination of the question of water supply for the canal and of the probable amount of traffic through the same, declined to entertain the proposal.

Recently the *Société nationale d'initiative et de propagande pour l'exécution du Canal des Deux Mers* has been formed, which hopes to float the concern in spite of Government opposition, through pressure of public opinion. With this object the company solicits expressions of approval from various authorities, chambers of commerce, mercantile companies, public men and private individuals. It has, however, met with but little success up to now, which need not cause surprise, considering how recently the Panama "bubble" burst.

The difficulties which beset the *Canal des Deux Mers*, both as to its construction and subsequent working, can best be seen on examining the project with the help of a map.

The canal begins at the tidal harbour of Bordeaux, skirts the town on the west side and follows the left bank of the Garonne, which offers no difficulties, for a length of 53 miles. At Castels the line crosses the mouth of the Garonne-Canal. Between this point and the spot where the canal crosses the Garonne near Castelsarrasin there are two sections, near Layrac and near Auvillars, which cause difficulties, owing to the nature of the river banks. The line of the canal has therefore to be

carried along the river bed, necessitating the construction of a wall to separate it from the waters of the river, whilst the width of the latter must be restored by digging away the right bank.

In this manner the canal continues south behind Caumont and Mas d'Agenais so as to avoid some marshy tracts.

Along the right river bank the canal is carried without much difficulty to Toulouse, where large basins and an embankment for regulating inundations are planned. To the westward of Toulouse the canal crosses the Garonne a second time, and immediately afterwards to the southward a third time, whilst the branch canal at the same time opens into the basins which are also connected with the existing *Canal du Midi*. The latter crossing facilitates the creation of large docks on both banks of the Garonne, of which those on one side are intended for the sole use of the French Navy.

The canal now continues over the Col de Naurouse, Castelnaudary, Carcassonne, les Cols de Maux and Montredon. Before Naurouse the canal cuts twice through the *Canal du Midi*, which will have to be led clear so as to avoid the construction of locks.

Of the several proposals as regard the southern mouth of the canal near Narbonne, the scheme decides in favour of a spot near Gruissan, as there the military works required for the defence of the entrance of the canal from the sea would be easiest of construction.

The length of the canal proper is put at 249 miles, the mouths and approaches at 77, making a total length of 326 miles. The curves are struck with radii varying from 2,000 to 5,500 yards. The depth of water is to be 27·9 feet.

According to an opinion expressed in 1893 by M. Réné Kerviller, Chief Engineer of the State Department of *Ponts et Chaussées*, the Gironde is unsuitable as the mouth of the canal, and it would have been preferable to carry the canal to the Bay of Arcachon, which would mean an additional length of 33½ miles, and a corresponding increase of cost.

Carrying the canal over the watershed, the Col de Naurouse, 625 feet high, causes, of course, considerable difficulties. The project places the highest section into a cutting 165 feet deep, whilst the ascent of the remaining 470 feet is accomplished by means of eighteen locks, the descent by twenty, with drops varying from 23 to 30 feet. That it will be possible to construct lock-gates—in this case caissons moving laterally—of the required dimensions, that is, 59 to 62 feet high, and 66 feet wide, French engineers do not doubt, as they quote the authority of M. Eiffel, who designed such gates for the Panama Canal.

The canal scheme provides for four different cross-sections, viz. :—

(1) For cuttings into the solid rock.
(2) For cuttings in non-rocky soil.
(3) For built-up sections.
(4) Where crossed by so-called "canal bridges."

The banks are to be faced with masonry. The locks are to be 657 feet long, and 82½ feet wide. The six "canal bridges" planned

(of a total length of 1¼ miles) are to be supported by masonry arches. Where they cross the canal its section will show the least width, viz., 66 feet wide on the floor, and 89 feet wide at the water level.

A second difficulty which presents itself is the question of water supply, as the existing sources would only be able to supply the required 6,600 gallons per second during sixty-two days of the year. During 238 days the supply would only be 4,400 gallons, whilst during the remaining 65 days they would contribute nothing at all. By means of special reservoirs or basins adjoining the locks, the water consumption could be reduced to a certain extent, but this would prevent the simultaneous use of the locks for ascent and descent, which is considered objectionable, besides adding to the time required for passing through the locks.

The scheme, therefore, provides for a number of reservoirs on the lower slopes of the Pyrenees. As, however, the proposal includes a plan of utilising the canal for periodically flooding about 75,000 acres of vineyards for the destruction of phylloxera, for irrigating 125,000 to 1,000,000 acres of arable and meadow land during the dry season, and, finally, for supplying water power for the use of machinery wherever required, a water supply of 13,200 gallons per second would appear none too large, and yet the reservoirs would reach enormous dimensions.

A further difficulty to be surmounted in the construction and subsequent working of the *Canal des Deux Mers* consists in the fact that it cuts through the 239 lines of communication. It is hoped to meet this with the help of 163 swing-bridges, and by the construction of tunnels.

Large sums would be further absorbed by the laying of lines of rail along both sides of the canal, as, owing to the weakness of the banks, ships could not be allowed to use their own steam, but would have to be towed, joined up in "trains," averaging 3,800 tons, by four engines—two ahead, and two astern for stopping.

Finally, the canal requires "gares," 1,300 yards long, at intervals of 7½ miles, special cofferdams to facilitate any repairs to the banks, etc., extra width at the lock gates to prevent damage to the banks owing to rush of water on emptying or filling the locks—all matters which necessitate considerable and costly preparations.

Whilst, however, the feasibility of constructing the canal from the technical point of view has not been questioned, the same cannot be said of the proposed plan of working the canal when completed.

The project bases its calculations of the total time of transit on an average speed of just under 7 miles per hour from lock to lock. Taking into consideration the delay, difficult to estimate, in passing through the locks and "canal bridges," one may estimate the time of transit from sea to sea as eighty-three hours, under the most favourable conditions, which represents a mean speed of 3·1 knots per hour.

The large number of swing-bridges necessitates a careful regulation of the traffic, it is therefore intended that ten "ship-trains" shall pass through the canal daily in both directions, according to a regular time-

table. The engines will have to be divided along the different sections according to the locks, which gives a total of 152 engines working day and night.

The Commission appointed by the Government in 1886 to examine the question of water supply estimated the cost of making the canal at close upon £80,000,000. This sum included £12,000,000 for the completion of the approaches and the fortifications at the mouths, also £6,800,000 for the scheme of flooding and irrigating. The *Société d'études* at that time put the total cost at only £36,000,000, which would be only at the rate of £116,000 per mile for a canal over 300 miles in length. When one considers that the cost per mile of the Suez Canal was £174,000, of the Corinth Canal £450,000, of the Manchester Ship Canal £323,000, and of the Baltic Canal £130,000, one will, in view of the enormous technical difficulties, look upon the estimate of £260,000 per mile, as laid down by the Commission of 1886, as erring, if anything, on the side of insufficiency.

The cost of maintenance and the working expenses are unanimously given by experts, who have gone into the question, as £1,200,000 per annum. When the interest (at 5 per cent.) of the capital, to the amount of £4,000,000, is added, we reach a sum of £5,200,000, which the canal must earn every year, to pay its expenses. At the proposed tariff of three shillings per ton this corresponds to an annual transit of between thirty-four and thirty-five million tons, which however can never fall to the share of the *Canal des Deux Mers*, since only twenty-two to twenty-three million tons pass through the Straits of Gibraltar in the year, and only about eight million tons through the Suez Canal!

To enable us to consider the shortening of the sea routes which the *Canal des Deux Mers* may be expected to bring about, in comparison with the voyage through the Straits of Gibraltar, we will only take two of the principal routes.

(1) From Ushant to Malta—			
(*a*) *Viâ* Gibraltar	1,930	nautical	miles
(*b*) *Viâ* the Canal (not counting the Canal itself	966	,,	,,
Shortened by	964		
(2) From Ushant to Marseilles—			
(*a*) *Viâ* Gibraltar	1,635	,,	,,
(*b*) *Viâ* the Canal (not counting the Canal itself	376	,,	,,
Shortened by	1,259	,,	,,

Taking the time required to pass through the canal at 83 hours, a simple calculation will show that on the first route only vessels of less than 11½ knots speed, on the second those of less than 15¼ knots speed, would save time by going through the canal. This saving of time, moreover, would increase in proportion as the speed decreased; for

instance, a 10-knot vessel would save 13 hours on the first route, 43 on the second. Should, however, the time of transit—as seems very probable—be longer than 83 hours, say 93 hours, then only ships of less than $13\frac{1}{2}$ knots speed would save time on the second route. But "saving of time" is in this case not by any means "saving of money," for the use of the canal will cost money, and, indeed, a good deal more than the value of the coal which the ship would save by using the canal.

After what has been said about the canal scheme, it seems clear that shipowners will only be willing to expose their vessels to so protracted, difficult, uncertain and dangerous a passage in return for very substantial advantages. All the more so, as the approaches to the mouths of the canal are none of the easiest, owing to the strong westerly winds, which blow the greater part of the year into the Gulf of the Gascogne and the mouth of the Gironde, and to the stormy weather generally to be met with in the Gulf of Lyons, which contains the other entrance.

What class of merchant ships then would derive any benefit from this eighty-million canal? Solely the small and slow coasting vessels. There can be no doubt that the same effect could be produced with a modest expenditure by deepening the existing *Canal du Midi* from $6\frac{1}{2}$ feet to $11\frac{1}{2}$ feet; it might then be advisable for the State to take it on.

The promoters of the scheme lay great stress on the extraordinary advantages offered by the creation of new and extensive coast lines (*i.e.*, the banks of the canal), of new fishing industries, of irrigation and flooding arrangements, of great water power, which in turn would cause increase of trade, increase the productiveness of the soil and give an impetus to fresh industries. Everyone must be left to judge for himself how far these problematical advantages will outweigh the expenditure involved.

Concerning the value of the canal for purposes of national defence, and to the Navy especially, the authorities on those matters are practically in agreement, and the most noteworthy of these opinions may as well be given here.

The victor in the Franco-Chinese War, Admiral Courbet, spoke as follows, showing agreement with Field-Marshal Count von Moltke's well-known dictum.[1]

"This project: What an illusion! How can you hope to be able, unmolested, to fetch the enemy out of this or that sea to wherever you may desire to have him! Should you not, on the contrary, expect him everywhere, without exposing yourself anywhere? And if you are not going to admit any but this consideration from the stragetic point of view, you should not construct a canal, which we would never use, but build men-of-war for the sum this work would require; that would be a very much more effective way of furthering the cause of national defence."

How much more does Moltke's opinion apply to this canal with its thirty-eight locks, its canal bridges, its fragile banks, its mouths so

[1] When the importance of a Baltic Canal for naval strategic purposes was urged upon him, he said: "Far better spend the money on battle-ships."—L.B.

exposed and difficult of protection, than to the Baltic Canal, carried through on the level of the sea, of barely one-fifth the length and with admirably-protected mouths!

Admiral Fourichon called the canal a "mouse-trap," and has thus furnished the *bon mot*, which may be taken to sum up every discussion of the *Canal des Deux Mers* in leading Naval circles.

Rear-Admiral Réveillère, in his recent work, "The Conquest of the Ocean," pronounces an elaborate condemnation of the canal scheme. After discussing the serious delay in the Army mobilisation which would be caused by the obstruction of the land communications cut by the canal, he advocates the deepening of the *Canal du Midi*, for purposes of the coasting trade, and says that then this canal could also be of use to torpedo-boats and the smaller war-ships. He lays stress on the ease with which nowadays, owing to the fact that powerful explosives are in such general use, a spy or traitor could destroy the *Canal des Deux Mers*, and finishes with the words:—

"Who would ever confide a squadron to such a mouse-trap? A squadron must be ever ready to strike a blow and must be master of its movements. What splendid achievements an enemy could carry out, when he knew our squadron to be thus imprisoned!"

The gigantic difficulties which beset the construction of a maritime canal between the two seas naturally have acted as a mighty stimulant on the race of engineers, and the idea once started and fostered will not easily cease to fill men's minds, all the more as the possibility of overcoming the purely technical difficulties of this mighty enterprise is not seriously disputed by any one. An actual start on the project should be received with grateful approval, as tending to further our knowledge of that branch of engineering; from all other points of view the scheme must decidedly be rejected. Notwithstanding its many changes of Cabinets the French Government has treated the scheme with uniform indifference. Determined and reasoning opposition the idea has only met with at the hands of men who, at the risk of being accounted *mauvais patriotes*, consider the propaganda for the *Canal des Deux Mers* to be inimical to the prosperity and safety of their native country, and who would wish to preserve France from a second Panama.

NAVAL AND MILITARY NOTES.

NAVAL.

HOME.—The following are the principal appointments which have been made: Rear-Admiral—H. G. Andoe, C.B., to be Admiral Superintendent of Chatham Dockyard, vice G. D. Morant. Captain—H. W. Dowding to "Urgent," as Commodore of the second class in charge of Dockyard, vice T. S. Jackson. Commanders—T. H. Hemming to "Dart"; P. Hoskyns to "Blonde"; C. J. Sawle to "Mohawk"; E. P. Ashe to "Beagle"; G. Langford to "Acorn"; R. C. Sparkes to "Linnet"; J. Startin to "Barrossa"; C. A. Forlong to "Tyne"; E. J. Fleet to "Icarus"; C. E. Kingsmill to "Archer."

The first class cruiser "Grafton" is to be commissioned to take out a new crew for the "Camperdown," which will re-commission at Malta; the second class cruiser "Sappho" takes out new crews for "Melita" and "Scout," also to Malta; the third class cruiser "Blanche" is to perform the same duty for her sister-vessel the "Blonde," to Sierra Leone; while the "Icarus" sloop is to proceed to the Pacific. The "Tyne" is to be paid off, and will no longer perform duties as a troop-ship. She is to be re-commissioned as a store-ship, and proceeds to the Mediterranean to relieve the "Humber," which ship is ordered to China for service as a store-ship for the fleet in those waters.

According to the *Naval and Military Record*, the second class cruiser "Amphion," which recently returned from the Mediterranean Station, is to assume a new *rôle*, and it is reported that she is to be used for conveyance of relief crews. There are a large number of vessels in the Reserve at Portsmouth and Devonport in as good condition, and with equally good accommodation for such service, but the "Amphion" has been chosen mainly on account of her economical steaming capabilities, together with her unusually large coal-carrying capacity. In her bunkers alone she can stow 1,000 tons of coal, a supply sufficient to enable her to steam a distance of 11,000 knots at a speed of 10 knots an hour. The surveying officials estimate the sum of £36,000 to make the vessel fit for a commission on foreign service, but in view of the frequent opportunities she will have for visiting the home dockyards, she can be made ready for this service at a reduced estimate. As no provision for carrying out the refit was made in the Navy Estimates, and as the amount is too large to be made up of savings from other works, the Admiralty are now corresponding with the Devonport officials with a view to deciding which of the refits arranged for this year shall be deferred. Although the "Amphion" has been almost continuously employed since July, 1887, she can still steam at a 16-knot speed, and is a capital "sea boat." Her refit will include the substitution of ten 6-inch Q.F. guns for her present armament of 6-inch breech-loaders. The "Amphion," although termed a troop-ship, will be solely employed for effecting the relief of naval crews; in fact, she will be engaged on the service now performed by the "Tyne."

The new second class cruiser "Hermione" since the conclusion of the manœuvres has been carrying out some steam trials off Plymouth, and on the measured mile in the Solent. The first trials took place on the deep-water course between Plymouth and Falmouth, and the mean results for four hours with natural draught were:—Steam pressure in boilers 140, in engines 134 lbs.; vacuum, starboard 24·6, port 26 inches; revolutions, starboard 126·5, port 126·3; I.H.P.,

starboard 3,587, port 3,620, total 7,207; air pressure ·42 of an inch; speed by log, 18·3 knots. The mean results for two hours' steaming with forced draught were:—Steam pressure in boilers 152, in engines 147 lbs.; vacuum, starboard 24·9, port 24·6 inches; revolutions, starboard 132·6, port 135-9; I.H.P., starboard 4,254, port 4,790, total 9,044; air pressure, 1·1 inch; speed by log, 18·95 knots. After about an hour's steaming with forced draught, it was noticed that the intermediate pressure slide rod of the port engine showed signs of excessive heating, and the engine was eased down for a short time. Had it not been for this the mean speed would have been at least 19 knots, as during a portion of the trial the vessel was steaming at the rate of 19·3 knots.

The officials in charge of the vessel were highly pleased with the results, for, notwithstanding the fact that the vessel was in commission, and her bottom not very clean, and she exceeded her designed load draught, the results of these trials are practically the same, as regards speed, as were obtained eighteen months ago. On that occasion the vessel was run by her machinery contractors under the most favourable conditions, viz., a clean bottom, at designed load draught, and under the direction of the contractor's special staff of engineering officials and mechanics, and then, with an I.H.P. of 9,264, the speed recorded was only 19·5 knots.

After coaling, the ship proceeded to Portsmouth, and various runs up to 16 knots were made; the final trial was made under natural draught, with the ship down to her proper load line with the crew and all stores on board, when a mean speed of 18·3 was maintained, the engines working quite easily, and with an entire absence of undue strain.

The "Sharpshooter," torpedo gun-boat, which has been carrying out a programme of progressive trials, is now in dockyard hands having defects made good. During the past two months she has undergone, with very satisfactory results, no fewer than eight steam trials, each over a course of 1,000 miles, and although minor defects have developed in her engines, her boilers (of the Belleville type), for the testing of which the trials were specially arranged, have worked most satisfactorily. After her last trial it was discovered that one of her low-pressure cylinder covers was cracked, and a new one is being manufactured at Keyham. This is the most serious defect that has developed in the vessel since her removal from the Channel Squadron. The Keyham staff are also replacing a number of defective fire bars and effecting other repairs of a minor character. It was expected that the vessel would be ready to resume her trials on the 4th inst., when the last and most severe of the trials provided for in her programme will be undertaken. The trial will be with six boilers only, and will be continued for a distance of 1,000 miles, or until the coal abreast of the boilers has been used. The engines are to average an I.H.P. of 2,150, being 150 more than has yet been undertaken. The crew have during the later trials been seriously inconvenienced by the excessive vibration of the vessel, and although every confidence is placed in the boilers, it is feared that the engines will not stand the additional strain to which they are to be subjected without developing serious defects.

The work on the new first class twin-screw cruiser "Terrible," which since her launch on May 27th has been lying in the tidal basin of her builders, Messrs. J. and G. Thomson, of Clydebank, is being rapidly proceeded with. All the steel work on deck, as well as internally, has now been completed, and the masts and topmasts with the military tops are on board. The wood decks are all completely laid, and the magazines are lined, and store rooms well advanced. The cabin bulkheads are all fitted, and the cabins ready to receive their furniture. The barbettes for the 9·2-inch guns are finished and ready to receive them. The first of the armoured casemates for the 6-inch guns—of which 12 are to be fitted—is now in the works and will be fitted in place in a few days, and the remainder

are shortly to be delivered from the makers, The forward and after bridges are nearly completed, and the conning tower is in its place. The windlass, warping capstans, and steering gear are all on board and anchor arrangement completed, and the boats' davits and gear fitted. The machinery, with the exception of a small portion of the auxiliary machinery, is now in place and the protective and other decks have been closed over it. The boilers, being of the Belleville type, can be put into the ship in small sections, and no large temporary openings in the decks (as are necessary with the ordinary type of marine boiler) are required. The decks and casings over the boiler rooms have, therefore, been completed, and the boilers are now being put on board. Already steam has been raised on two of the boilers on shore in order to determine their evaporative efficiency.

Rapid progress is being made with the construction of the battle-ship "Mars," at Birkenhead, and the armour-plates are being fixed to her sides at the rate of about 100 tons per week. Her construction in dock has enabled Messrs. Laird Bros. to make a much greater despatch than have Messrs. J. and G. Thomson, Clydebank, with the "Jupiter," the other first class battle-ship building by contract. The "Mars" might be floated at any time, but some months must elapse before the "Jupiter" will be ready to take the water.

Plating operations in the two second class cruisers "Juno" and "Doris," building at Barrow, are well advanced, and the first-named will be ready for launching very shortly. This type of cruiser comprises nine vessels, four of which are under construction on the Clyde and three in the Royal Dockyards. They embody features which are entirely absent in earlier vessels of the same category, in the list of British second class cruisers. One particular and noteworthy feature is the introduction of military tops, a circumstance that necessitated slightly different proportionate dimensions of hull, to ensure sufficient stability in a sea way.

The first class battle-ship "Prince George" was launched at Portsmouth on the 22nd ult., H.R.H. the Duchess of York performing the christening ceremony. The "Prince George," writes the *Times* correspondent, is one of the nine first class battle-ships which were ordered to be built under the Spencer programme. The principal dimensions of the ship are:—Length between perpendiculars, 390 feet; breadth, extreme, 75 feet; mean draught of water, 27 feet 6 inches; displacement when fully equipped, about 15,000 tons. She will be fitted with twin screws, each of which will be driven by an independent set of engines with three vertical cylinders and of 6,000-H.P., giving a total H.P. of 12,000 for both sets of engines, with a working pressure in the boilers of 150 lbs. per square inch, and an air pressure in the stokeholds equal to 1 inch of water. The amount of coal usually carried will be 900 tons, but the vessel has a total stowage capacity of 2,220 tons. The disposition of her protective armour is similar to the "Majestic's," the arrangements combining the advantages of the turtle-back deck of the cruisers with those of the citadel armour of the former battle-ships. The ammunition is also supplied to the guns through passages and trunks which are all either constructed of armour or are under protection of armour. The advantages gained by this arrangement over the unprotected broadside are obvious. The ship will be fitted with two masts, with two fighting tops on each. Each top will carry three 3-pounder Q.F. guns, with the necessary magazines and equipment. Each mast will also carry on a platform at its head a powerful electric light for signalling and search purposes. The "Prince George" will be fitted with the new 12-inch breech-loading steel and wire guns, which, though much lighter than the type fitted in previous battle-ships, will surpass them in power of penetration, and in consequence of their reduced weight will enable all fittings in connection with them to be reduced in size, rendering the whole of the machinery much lighter and easier to work, efficiency being thereby proportionately increased. These guns will be fitted in pairs in two armoured redoubts, one at each end of the ship,

and will be mounted on revolving turntables, the whole being worked either by hydraulic or hand power. These guns will be protected by an armour shield 10 inches thick, as in the "Majestic," an advantage not possessed by previous battle-ships of this size. This vessel will also carry twelve 6-inch Q.F. guns, mounted in casemates, protected by 6-inch Harveyized armour, eight of which are on the main deck and four on the upper deck. Each gun and its crew will thus be completely isolated from the others, orders being communicated from the central fighting station by means of a system of voice pipes. Sixteen 12-pounder Q.F. guns will be also mounted on the main and upper decks, and the vessel's armament will be completed by the twelve 3-pounder Q.F. guns in the military tops, by two 12-pounder boat and field guns, and by eight ·45-inch Maxim guns mounted in suitable positions; 22 torpedoes will be carried, which can be fired from four submerged tubes, two forward and two aft, and one above-water tube at the stern. Six search-light projectors, worked by three dynamos, each of 600 ampères, will be carried. Ten steam fans will be fitted for the purpose of ventilating the working and living spaces, two for ventilation of the engine-rooms, and eight for furnishing the forced draught for the boilers. The vessel will have a complement of 757 officers and men.

The first class battle-ship "Magnificent" has been undergoing her trials satisfactorily, while the official ones of the "Majestic" were to commence on the 9th inst.

The "Hecla" is to be fitted out so as to bear the same relation to the Fleet Reserve at Portsmouth as the "Vulcan" bears to the Mediterranean Fleet, and an order to that effect has been issued. The order directs that the "Hecla" is to be used as a workshop for the general repairs and maintenance of ships in the A and B divisions of the Fleet Reserve, but is to be kept in readiness for immediate service on an emergency.

The opportunity was taken during the recent Naval Manœuvres thoroughly to test two new systems of transmitting long-distance signals by night and day between ships at sea. The instruments used in connection with the experiments are the separate inventions of two naval officers, and in both cases it is understood the results obtained were satisfactory, showing a decided advance in a matter of paramount importance in carrying out steam tactics and other evolutions incidental to modern warfare afloat. It is stated that the mast-head semaphore devised by Rear-Admiral A. K. Wilson, *V.C.*, has proved exceedingly useful for rapid and trustworthy communication with vessels within a radius of 10 miles, beyond which distance the movements of the arms could not be clearly made out. The collapsible drum, invented by Rear-Admiral C. G. Fane, Admiral Superintendent of Portsmouth Dockyard, could not be manipulated quite so quickly as the semaphore, but it may find more favour in the eyes of experts, inasmuch as signals made with it on board the "Blenheim" were accurately and easily read on board the flag-ship "Royal Sovereign," 16 miles away.

It is certain, however, that the result of further trials both in the Channel and Mediterranean will be awaited before any definite system is finally adopted, and it would appear that at present the balance of opinion inclines to the belief that for night signalling an electric light worked at the mast-head on the flash system will prove the most effective.

The Naval Manœuvres do not seem to call for any special comment; the most important purpose intended was the practice of the cruisers in scouting duties, and with this object the following order was issued by the Admiralty:—"Both fleets are to leave their respective ports on Thursday afternoon, August 8th, weather permitting, and each will proceed to a rendezvous to be hereafter communicated to the Admiral in command, from which position they will take the necessary measure by means of their scouts and cruisers for finding each other and effecting a junction."

We are indebted to the *Army and Navy Gazette* for the following concise description of the operations :—

"The ports of departure of the fleets were : For the northern one, under Admiral Seymour, Lough Swilly ; and for the southern one, under Admiral Lord Walter Kerr, Berehaven or Bantry Bay, and each fleet was supplied with a large number of second class cruisers and first class gun-boats of fair speed and coal endurance. August 8th turned out to be a day on which the weather was not suitable for a start, and, therefore, the fleets did not leave until August 9th. At nine a.m. on this day, Admiral Lord Walter Kerr put to sea with the Channel Fleet, and shaped his course for the secret position or rendezvous given to him by the Admiralty. It proved to be in latitude 53·30 north and longitude 17·30 west, or as near as possible 300 miles from Berehaven in a north-westerly direction from that port. The rendezvous was reached at six o'clock on the evening of August 10th. Admiral Seymour with the Reserve Fleet did not leave Lough Swilly quite so early, circumstances detaining him until after 10 a.m. His appointed rendezvous was in latitude 54·40 north and longitude 15·30 west, which is roughly between 290 and 300 miles from his port of departure in a direction somewhat to the southward of west. Owing to an accident it became necessary to stop the fleet on the night of August 10th for several hours, so that it was not until 7 p.m. on the following day that the Reserve Fleet arrived at its rendezvous, or just an hour after the Channel Fleet had commenced its searching operations. In considering the facts it is to be remembered that the Admiralty did not give any directions about the speed to be maintained in proceeding to the rendezvous, and it was quite as likely as not that if nothing had detained the Reserve Fleet its scouts might have commenced their search three or four hours earlier than was actually the case. What would have happened had this taken place can be calculated by those who care to work out the positions of the two fleets from the data here given, remembering that until its rendezvous was reached neither fleet threw out its scouts to any great distance from the main body or battle squadron.

"In estimating the possible whereabouts of the fleet for which he was to search each admiral was bound to work largely on assumption, governed by common sense and the factors of time and distance already mentioned. Each admiral might fairly presume that the distance to be covered by the other would approximate to that he was ordered to make himself. Nor was it likely that either fleet would be sent to the eastward of its port of departure. It was also probable that their tracks would not be made to cross, but that Lord Walter Kerr might expect to find the Reserve Fleet to the northward and Admiral Seymour the Channel Fleet somewhere to the southward. In fact, everything appeared to point to the two fleets being within an area enclosed by lines drawn from the ports of departure 300 miles to the westward, and these connected by a north and south line, the fourth side of the parallelogram being the west coast of Ireland. Admiral Seymour probably drew his southern line parallel to that made by his own course, and Admiral Lord Walter Kerr his northern line parallel to that made by the course which took him to his appointed position. It may be said that these are large assumptions ; but some such speculation must have influenced the two admirals, and that they were not entirely mistaken the result proved.

"Each admiral having roughly decided the area over which his search should extend, we come to the methods employed for the purpose, which were widely different. Lord Walter Kerr appears to have looked at the matter entirely from the aspect afforded by the instructions and general orders. He was ordered to search for a friendly fleet ; it was not needful, therefore, to take the precautions which would be rendered necessary by the possible presence of foes. He gave each of his twelve cruisers a course to make which would enable them to sweep an area between north and south-west of all the seas between himself and the

Irish coast, as well as considerably to the northward. The course and distance each vessel was to make was as follows:—

Cruiser.	Course.	Distance.
Charybdis	North	210 miles.
Apollo	N. by E.	230 ,,
Latona	N.N.E.	240 ,,
Forte	N.E. by N.	250 ,,
Iphigenia	N.E.	260 ,,
Indefatigable	N.E. by E.	270 ,,
Speedy	E.N.E.	275 ,,
Jason	E. by N.	To Eagle Island
Niger	East	To Slyne Head
Bellona	About E. by S.	To the Shannon
Pearl	About E.S.E.	To the Blaskets
Andromache	About S.E.	Towards Fastnet Light

"The speed each ship was to make was between 14 and 15 knots, and as soon as she reached the limit of her cruise she was to turn and steer for a rendezvous 20 miles west of Blackrock Light, off Blacksod Bay. The battle squadron of the Channel Fleet with three gun-boats started at the same time, but at 7 knots' speed, direct for the same rendezvous. Each captain of a cruiser was instructed that, in the event of his meeting with a ship of the Reserve Fleet, he was to inform her of the movements and approximate position of the main body of the Channel Fleet, and having ascertained the position of the Reserve Fleet battle squadron to rejoin the flag at full speed.

"The method employed by Admiral E. H. Seymour differed from the above materially. In the first place it was apparently designed for use under conditions of actual war, when to allow all the cruisers of a fleet to lose touch with the main body for any long period might prove particularly disadvantageous. He arranged, therefore, that every twelve hours all the fleet should come together again, a process which diminished the size of the field in which the search was progressing. His cruisers and gun-boats were subdivided into 'scouts,' or ships which for a time were actually out of touch with the main body, and 'look-out ships,' which were placed at some distance, but between which and the flag communication was always maintained by a third division known as 'linking ships.' By night the four scouts, in pairs, steamed off diagonally outwards from the course the battle squadron was to maintain, and having gone 26 miles on this outward course, they then assumed the same course as the main body, rejoining it by inward diagonal courses in the morning. The front thus presented at its widest portion was 60 miles. Inside of this area the look-out and linking ships were arranged in a fan-shaped formation ahead and on the bows of the battle squadron, the ten vessels being two miles apart. By day the course of the scouts and the distances between the look-out ships were increased to nearly double, so that more than a hundred miles were to be searched. The instructions to the captains of the scouts, working in pairs, were that in the event of sighting a ship of the Channel Fleet one vessel was to communicate with Lord Walter Kerr and the other to return to the flag with information. The captains of the look-out vessels were in similar circumstances to work their search lights, throwing the beam high in the air and then towards the strange vessel, so as to call attention and denote the direction in which the stranger was seen.

"As is now known, the cruisers of the two fleets came together within six hours of the Reserve Fleet starting from its rendezvous, the 'Jason' being met by the Reserve look-out vessels, 'Thames' and 'Tribune,' while the 'Iphigenia' had also communicated with the scouting vessels. The battle squadrons of the two

fleets effected their junction shortly after noon on August 11th, or about seventeen hours after they had commenced their search.

"It cannot be disputed that the educational value of the scheme is very large if regarded merely as an exercise for the officers, who were thus led to study the alternative plans adopted. It is, perhaps, a pity that a greater distance did not separate the positions assigned to the fleets, but the element of chance entered largely into the premature solution of the problem, for it is conceivable that had there been no delays with the Reserve Fleet, it might have been so far south when the Channel cruisers crossed its course as to have been missed by all of them."

With regard to the operations carried out in the Irish Channel by the torpedo-flotilla under the orders of Rear-Admiral Wilson, the net result seems to have been that in spite of the blockading squadrons of torpedo-boat catchers the bulk of the torpedo-boats appear to have found no difficulty in eluding them and breaking out of the blockaded harbours, afterwards attacking with some measure of success the main body of the fleet passing up the Irish Channel, for the "Hermione," Rear-Admiral Wilson's flag-ship, is reported to have been successfully torpedoed.

AUSTRIA-HUNGARY.—It is reported that the construction of the new armoured cruiser (of an improved "Kaiserin und Königin Marie Theresia" type), and for which provision is made in the budget for next year, will be entrusted to the Stabilimento Tecnico Triestino at San Rocco, near Trieste, which firm has already built so many vessels for the Imperial Navy.

The Minister of Marine has decided that the new coast-defence battle-ship "Buda-Pest," lately launched at Trieste, is to be fitted with the Belleville water-tube boilers; she will be the first ship in the Navy to be so fitted, and an exhaustive series of competitive trials will be carried out between her and the two sister-ships, the "Monarch" and "Wien," as all three ships will be completed about the same date.

The cruising and manœuvre squadrons have been paid off and placed in the first division of the Reserve, but the "Maria Theresia" is to serve during the winter as the stationary drill-ship; the torpedo-depôt-ship "Pelikan" is to be commissioned; the training squadron for cadets and seamen is to be composed of the battle-ship "Tegetthoff," the frigate "Laudon" (flag-ship), the spar-decked corvette "Donau," the torpedo-aviso "Sebenico," and the gun-boats "Hum" and "Nautilus"; the torpedo-training flotilla is to be composed of the torpedo-avisos "Lussin" and "Meteor," and the sea-going torpedo-boats "Secretär," "Ibis" "Weihe," and Nos. "13," "15," and "16." All the above vessels are to be commissioned immediately.—*Militär Zeitung.*

BRAZIL.—Through its special representative in France, Admiral J. de Proença, the Government last spring ordered from the Société des Forges et Chantiers de la Méditerranée, at La Seyne, near Toulon, two small armour-clads. They are intended chiefly for operating along the coast, and are of light draught. The dimensions are:—Length, 267 feet 6 inches; beam, 46 feet 11 inches; mean load draught, 13 feet 2 inches; displacement at this draught, 3,162 tons. The designs are by M. Lagane, directing constructor of La Seyne yard. The I.H.P. of the engines with natural and forced draft are, respectively, 2,650 and 3,400, and the corresponding speeds are 13 and 14 knots. The armament will consist of four 9·4-inch B.L.R. mounted in pairs in turrets forward and aft; four 4·7-inch Q.F.G.; two 5·9-inch rifled howitzers or long mortars; two 3-inch (12-pounder) Q.F.G.; four 6-pounder Q.F.G.; two 1-pounder Q.F.G.; two 1-inch machine-guns; and two torpedo ejectors. There will be a thick steel armour-belt, a protective deck, and heavy armour on the turrets. The number of different calibres in the guns

of the secondary battery seems wholly unnecessary, and liable to cause confusion and trouble with the ammunition supply.

The battle-ship "Riachuelo," which for the last two years has been undergoing a thorough repair and overhaul at the yard of the Société des Forges et Chantiers de la Méditerranée, at La Seyne, near Toulon, is now ready to leave for Brazil. She was originally built in England, having been launched in 1883, and is constructed of steel, with her bottom sheathed with wood, and coppered. Her dimensions are as follows:—Length, 305 feet; beam, 52 feet; and with a mean draught of 19 feet 6 inches she has a displacement of 5,700 tons. The machinery develops 6,000-I.H.P. under natural and 7,300-I.H.P. under forced draught, the corresponding speed with the latter being 16·7 knots. Protection is afforded by a water-line belt of 11-inch compound armour, running three-fourths the length of the ship, terminating at the bow and stern by 10-inch transverse bulkheads, placed at such a slope that they almost form a protective deck, the protective deck itself being 2 inches; rising from the armour belt are two redoubts plated with 11-inch armour, one forward and one aft, not on the midships line, but on the side; above the redoubts are turrets protected with 10-inch armour, in each of which are mounted two 9·2-inch 22-ton Armstrong guns; formerly the ship carried an auxiliary battery of six 5·5-inch 5½-ton guns, two mounted forward for firing ahead, two aft for stern fire, and one on each broadside. Six 4-inch Q.F. guns of the latest Elswick pattern have now been substituted, and four torpedo-tubes on the Canet system to discharge the 18-inch Whiteheads have taken the place of four of an older pattern. The ship was formerly barque-rigged, but two military masts with fighting tops have now been fitted; the guns and ammunition hoists are also now worked by electricity; in fact, the ship has, as far as possible, been brought completely up to date.—*Le Yacht.*

FRANCE.—The following are the principal appointments which have been made: Vice-Admirals—Gervais to command in chief of Active Squadron of Mediterranean Fleet; Cavalier de Cuverville to command of the Reserve Squadron of Mediterranean Fleet. Capitaines de Vaisseau—Gourdon to "Courbet"; Foret as Director of Submarine Defence at Cherbourg. Capitaine de Frégate—Davin to "Hirondelle."—*Le Moniteur de la Flotte.*

The third class battle-ship "Trident" is to be fitted out at Toulon to relieve the "Richelieu," as flag-ship of the Reserve Squadron, on the 1st October; like the "Richelieu" the "Trident" is an old ship with a wooden hull, and she is probably commissioned now for the last time. The "Brennus," although commissioned on the 1st ult. to renew her trials, after the transformation to which her superstructure has been subjected, has not yet been able to do so, some slight defects in her machinery having come to light. The new armoured-cruiser "Amiral Charner" has been commissioned at Rochefort on the conclusion of her trials, and is to proceed to Toulon to reinforce the Active Squadron of the Mediterranean Fleet. The second class cruiser "Davout" has been detached from the Mediterranean Fleet and been ordered to Rochefort for repairs to her boilers, and also to have an armoured conning tower fitted. The new torpilleur-de-haute-mer "Ariel" has been commissioned at Cherbourg, and will relieve the "Archer," a vessel of an older type in the Squadron of the North, which will be placed in the Reserve at Brest. The coast-defence battle-ship "Requin" has been placed in the second category of the Reserve at Cherbourg, and the work of reducing her armour is to be taken in hand at once; on its completion she will proceed to Brest, where her two 42-centimetre guns will be replaced by two 34-centimetre guns of the latest model. The new second class cruiser "Bageaud" has had a preliminary trial off Cherbourg under forced draught, the engines worked well, but the consumption of coal was excessive, and the heat

in the engine and boiler-rooms very great. The first class battery-cruiser "Jean Bart," which is shortly to proceed to China, is to have her bottom sheathed with wood; this work and other repairs will take about six months. For some time past experiments have been carried on in the torpedo-cruiser "Vautour" of coal mixed with petroleum; the result has not been a success, as the flames have been so intense, that the tubes of the boilers have been so much damaged, that it will be necessary to replace them all. The new torpilleur-de-haute-mer "Forban" has made a preliminary trial, when a speed of 29·2 was maintained without pressing the boilers; it is fully expected that she will easily realise a speed of 30 knots. The 17th October is the day definitely fixed for the launch of the new first class battle-ship "Charlemagne." No commencement has yet been made with the new battle-ship "Gaulois," for which provision was made in this year's estimates; but it is now stated that she will be laid down on the same slip as the "Charlemagne" as soon as it can be got ready after the launch of the latter.

An unsuccessful attempt was made on the 22nd ult. to launch the new armoured-cruiser "Pothuau" from the yard of La Société des Forges et Chantiers de la Méditerranée at Havre. After starting, the vessel suddenly stuck fast, and all attempts to move her failed; it is not believed that she will sustain any damage, as she has been carefully shored up, and it is hoped that she will be floated at the next spring tides. The "Pothuau" is a vessel of an improved "Latouche-Tréville" type, having a displacement of 4,746 tons, which is some 600 tons more than her four prototypes, but she is still a thousand tons smaller than the "Dupuy-de-Lôme." Her dimensions are: Length, 367 feet 6 inches; beam, 50 feet 3 inches; with a mean draught of 21 feet 4 inches. Her engines are to develop 6,500-I.H.P. under natural and 10,000-I.H.P. under forced draught, giving a speed of 18 and 19 knots respectively. She will have Belleville boilers, and a coal stowage of 538 tons, giving her a radius of action of 900 miles at full speed and of 4,500 miles at 10 knots. The protection consists of a water-line belt of hardened steel 4 inches thick, and an armoured deck varying from 3·5 inches to 1·5 inches in thickness, while the turrets for her two heavy guns will also be armoured with 4-inch steel. The armament will consist of two 19-centimetre guns in the turrets, one forward and one aft; ten 14-centimetre Q.F. guns on the broadside, sixteen 3-pounder and eight 1·5-pounder Q.F. guns distributed in the tops and various parts of the ship with four torpedo discharges.

During the late manœuvres in the Channel it was discovered that both the armoured and the new second class cruisers were heavy rollers, a roll of 30° each way having been continually recorded in all of them.

As a result of recent disclosures an important reform has just been effected. It has been decided that a special department shall be founded at the Ministry of Marine for the purpose of drawing up plans of new ships, and of seeing that they are properly carried out in the State and private dockyards. A decree to this effect has been promulgated, and nothing now remains but to organise the service of the "Section Technique," as this department is to be termed. This is one result of the labours of the Naval Commission, which found fault with the construction of several battle-ships and other vessels that had to be subsequently modified.

The Budget for 1896, which has been presented to the Chamber, amounts to a grand total of 272,614,898 francs (£10,904,595), being an increase of 2,073,887 francs (£82,956) over the estimates for the current year, which amounted to 270,541,011 francs.

There is an increase of 7,356,107 francs, which is due to an addition of 751,340 francs to the pay and allowances of certain grades under the Decree of 28th June, 1894; to an increased charge of 1,993,045 francs, the cost of

strengthening the Channel Squadron by the substitution of new ships for the older vessels; to an increase of 716,200 francs under the heading of Works Department, while other details bring the total up to the amount stated above. On the other hand, economies are shown to the amount of 5,282,220 francs, which have been effected by withdrawing one battle-ship from the Reserve Squadron of the Mediterranean, the suppression of the Central Reserve Ships at Lorient and Rochefort, the withdrawal of one aviso-transport, two gun-boats and a second class aviso-transport, from foreign stations, the paying off of the troop-ships, and the non-expenditure of certain sums voted for new constructions, while there has also been a considerable reduction in the amounts demanded for guns and submarine defences, so that setting the economies off against the increased expenditure on other heads, leaves the net increase in the Budget at 2,073,887 francs.

The composition of the different squadrons is to be as follows :—

Mediterranean Fleet. Active Squadron.

Battle-ships—"Formidable" (flag-ship of Commander-in-Chief); "Brennus," "Amiral Baudin," "Courbet," "Dévastation," "Magenta," "Marceau," "Neptune," "Redoutable." Total 9.

First class armoured-cruisers—"Bruix," "Chanzy," "Amiral Charner."

Third class cruisers—"Cosmao," "Linois," "Troude."

Torpedo-cruisers—"Faucon," "Vautour," "Wattignies."

Torpedo-avisos—"Casabianca," "Cassini," "D'Iberville."

Torpilleurs-de-haute-mer—"Ariel," "Argonaute," "Chevalier," "Corsaire," "Forban," "Mousquetaire." A total of 27 pennants.

Reserve Squadron.

Battle-ships—"Amiral Duperré," "Trident."

Coast-defence battle-ships—"Caïman," "Terrible."

First class cruiser—"Isly."

Second class cruiser—"Suchet."

Third class cruisers—"Forbin," "Milan."

Torpedo-avisos—"Léger," "Levrier."

Torpilleurs-de-haute-mer—"Dragon," "Téméraire."

The Reserve Squadron will complete to full effectives for one month during the summer manœuvres, when the Reservists are called out; and for the remaining eleven months will have reduced complements (*effectif d'essais*).

At Constantinople is stationed the second class aviso "Pétrel."

The Squadron of the North.

Battle-ship—"Hoche" (flag-ship of Commander-in-Chief).

Coast defence battle-ships—"Bouvines," "Jemmapes," "Tréhouart," "Valmy."

First class armoured cruisers—"Dupuy-de-Lôme," "Latouche-Tréville."

Second class cruisers—"Bugeaud," "Friant," "Chasseloup-Laubat."

Third class cruiser—"Coëtlogon."

Torpedo-cruiser—"Fleurus."

Torpedo-avisos—"Lance," "Salve."

Torpilleurs-de-haute-mer—"Archer," "Dauphin," "Lancier."

This squadron has been increased from 15 to 17 pennants, while 815 officers and men have been added to the effective strength of its *personnel*, and the ships are to be in full commission for six months, instead of four as previously, and the remaining six with reduced complements (*effectif d'essais*).

The Atlantic Division.

First class cruiser—"Dubourdieu" (flag-ship of Rear-Admiral commanding).

Second class cruiser—"Descartes" for six months.

Third class cruisers—"Roland" for six months, "Fabert."

First class aviso—"Fulton."

Pacific Division.

Second class cruiser—"Duguay-Trouin" (carrying senior officer s pennant).
Third class cruiser—"Beautemps-Beaupré."
Transport-aviso—"Scorff."

China Division.

Battle-ship (Cuirassé de croisière)—"Bayard" (flag-ship of Rear-Admiral commanding).
First class cruiser—"Jean Bart" for four months.
Third class cruiser—"Forfait" for eight months.
Gun-boats—"Comète," "Surprise."
First class aviso—"Voltigeur."

In Cochin-China.

Gun-boats—"Aspic," "Vipère," "Bouclier," "Baïonette."
Depôt-ship—"Européen" and six torpedo-boats, her tenders, two in commission and four in reserve.

Ships in Reserve at Saigon.

Cuirassé de croisière—"Triomphante."
Gun-boats—"Styx," "Alouette," "Lion," "Lutin," "Caronade," "Cimeterre."

East Indian Division.

Third class cruisers—"Primauguet" (carrying senior officer's pennant, temporarily a Rear-Admiral during Madagascar Expedition), for three months Lapérouse" for nine months.
First class aviso—"Papin."
Aviso-transport—"Rance."
Gun-boats—"Étoile," "Lynx."
Depôt-ship—"Corrèze."

Ships for Special Service.

Battle-ship (Cuirassé de croisière)—"Turenne."
Third class cruiser—"Éclaireur."
First class aviso—"Parseval."
Third class aviso—"Lezard."

Ships for Local Duty in the Colonies.

At Algiers.

Torpedo-aviso—"Coulevrine."

At Tunis.

Torpedo-cruiser—"Condor."

At Senegal and the Guinea Coast.

Second class avisos—"Ardent," "Mésange," "Salamandre."
Depôt-ship—"Héroïne."

At Dahomey.

Third class aviso—"Oynx."

In the French Congo.

Third class aviso—"Cigogne."

At Guiana.

Third class aviso—"Bengali."

At the Society Islands.

Aviso-transport—"Aube," and "Papute" schooner as tender.

New Caledonia.

Third class aviso—"Loyalty."

For the Defence Mobile.

At Cherbourg.

One depôt-ship.

Torpedo-boats—Four first class, and four second class in commission; fourteen first class, fourteen second class, and one third class in reserve.

At Dunkirk.

Armoured gun-boat—"Flamme."

Torpedo-boats—Two first class, two second class.

At Brest.

One depôt-ship.

Torpedo-boats—Two first class, four second class, and two third class in commission; three first class, six second class, and four third class in reserve.

At Lorient.

One depôt-ship.

Torpedo boats—Three second class, and two third class in commission; three first class, five second class, and nine third class in reserve.

At Rochefort.

One depôt-ship.

Torpedo-boats—One first class, one second class, and three third class in commission; four first class, five second class, and three third class in reserve.

At Toulon.

One depôt-ship.

Torpedo-boats—Three first class, four second class, and two third class in commission; sixteen first class, eighteen second class, five third class, and six vedette-boats in reserve.

In Corsica.

One depôt-ship.

Torpedo-boats—Four first class, and four second class in commission; two first class, and two second class in reserve.

In Algeria.

Torpedo-boats—Six first class, and five second class in commission; four first class, and four second class in reserve.

Le Yacht, Le Moniteur de la Flotte, and *Annexe No. 6 du Projet de Loi (Budget des Dépenses du Ministère de la Marine)*.

THE NETHERLANDS.—The three new protected cruisers, for which provision has been made in this year's budget, are to be named the "Holland," "Zeeland," and "Friesland." They will be constructed of steel throughout, and their dimensions will be practically as foreshadowed in the Budget, viz.: Length between perpendiculars, 291 feet 3 inches; over all, 304 feet; beam, 46 feet 6 inches; displacement, 3,900 tons; mean draught with 400 tons of coal, 17 feet 6 inches, and with 800 tons, 18 feet 6 inches; the protective deck will be of 2-inch steel, and the conning tower of 4-inch. The engines are to develop 9,250-I.H.P. under forced draught, with 145 revolutions, and to maintain a speed of 20 knots for five hours; there are to be ten boilers, two of which will be cylindrical and the remaining eight Yarrow water-tube. The armament is to consist of two 15-centimetre (5·8-inch) Q-F. guns, one forward and one aft; six 12-centimetre (4·7-inch) Q-F. guns on the broadside; four 6-pounder Q-F. and eight 3-pounder Q-F. guns, with four torpedo-tubes for 18-inch torpedoes, one in the bow, one astern, and one on each broadside. The "Holland" is to be constructed in the Royal Dockyard at Amsterdam, the "Zeeland" by the Schelde Company at Flushing, and the "Friesland" by the Netherlands Company at Feije-Noord. All three ships are to be completed in January, 1898.

According to the "Jaarboek van de Kon. Nederl. Zeemacht" the present establishment of the *personnel* of the fleet is as follows:—Two Vice-Admirals, four Rear-Admirals, twenty-five Captains, thirty-five Captain-Lieutenants, 350 Lieutenants, 199 Cadets, total 615. Marine Infantry—One Colonel, two Lieutenant-Colonels, fourteen Captains, twenty-eight Lieutenants, three Cadets and five Quartermasters. One Inspector of Hospitals, six Deputy-Inspectors, seventy-seven Doctors, ten candidates under trial, and four

apothecaries; ninety-nine Officers for Paymasters' Duties, and twenty Engineer Officers; 8,175 Petty Officers and seamen, 2,126 Non-commissioned Officers and privates of the Marine Infantry; making a grand total of all grades of 10,301 officers and men, including 911 boys, 2,926 Naval-Militia, 346 engine-room artificers and 826 stokers.

In the East-India Division are employed twenty-one ships, carrying 2,378 officers and men, and four ships of the auxiliary squadron, with 1,416 officers and men, making a total of 3,794.

In the West-Indies are employed one corvette and one schooner, and for shore-service 2,380 officers and men.

For Home Service are twenty-nine ships, with 4,986 officers and men.

On Sea-Fisheries' Protection Service six ships, with 559 officers and men.

Mittheilungen aus dem Gebiete des Seewesens.

RUSSIA.—The Volunteer Fleet is rapidly developing into a powerful and useful auxiliary to the Imperial Navy. The last ship, the "Kherson," now building by Hawthorn, Leslie and Co., of Hebburn-on-Tyne (which firm built the "Orel," "Petersburg" and Saratoff," all vessels with a sea-speed of 19 knots and some 9,000 tons displacement for the same fleet), is to be of the following dimensions:—Length, 500 feet; beam, 54 feet; and a displacement of 10,000 tons, with a mean draught of 24 feet. The engines are twin-screws, triple-expansion, of 12,500-I.H.P., and are guaranteed to give a sea-speed of 19·5 knots. The ship is designed to carry 4,000 tons dead weight in addition to 1,400 tons of coal in the bunkers. There are to be twenty-four Belleville water-tube boilers, with 1,132 square feet of grate area, and 35,000 square feet of heating surface, and designed for a steam pressure of 250 lbs.; the boilers will be arranged in three groups of eight boilers each. Three smaller vessels are also being constructed on the Clyde for the same fleet, but as they are only to be of 14 knots speed, they will hardly be useful as cruisers. Last year the Volunteer Fleet made twelve trips to Vladivostock. This year sixteen are being made, and in 1897 it is expected that thirty-six outward and homeward passages will be made by the increased flotilla.

"Last month there was successfully launched from the shipyard and engine works of Messrs. Yarrow and Co., of Poplar, the new torpedo-boat destroyer 'Sokol,' which has been built by that firm for the Russian Government. This vessel, which is 190 feet long, 18 feet 6 inches beam, and has a displacement of about 240 tons, is the first destroyer in which nickel steel has been adopted as the material of construction, it having about 30 per cent. greater strength than the ordinary mild steel usually employed. She is fitted by her builders with their special type of twin-screw triple-expansion engines to indicate about 4,000-H.P., and estimated to give her a speed of 29 knots, the steam for driving them being supplied at a pressure of 200 lbs. per square inch by eight Yarrow water-tube boilers, having straight steel tubes, of which a large number have now been adopted in similar vessels for the British Government. The armament of the 'Sokol' will practically be the same as that fitted in the same class of vessel in the British Navy, two tubes being also fitted on her deck for discharging torpedoes over either side at an angle. The 'Sokol' was launched with engines, boilers, and all auxiliary machinery in place, and within an hour from taking the water had steam up and her engines in motion, and within 24 hours of the vessel's leaving the launching ways, she attained, when going through a series of preliminary trials, a speed which is unprecedented in the records of any similar vessels in this or any other country. At 2 p.m. the vessel was on the stocks, at 8 a.m. on the next day she left Messrs. Yarrow's works and proceeded down the river, for her preliminary trials, and on reaching the Maplins,

increasing speed trials were undergone, giving as results:—First speed, 25·8; second, 27·8; third, 29·26; fourth, 30·285 knots, these being in each case the mean speed attained on each set of runs made, the highest speed being realised with 416 revolutions of the engines per minute and the very moderate steam pressure of 170 lbs. per square inch at the boilers, the air pressure never exceeding $1\frac{3}{16}$ inch of water. The trials were made under the same conditions as our own official ones, with the exception that in the latter a steam pressure of 220 lbs. per square inch is allowed, and the dead weight to be carried, irrespective of gear, is 30 tons, whereas the 'Sokol' had actually on board a load of 35 tons. Throughout the trials, which were attended on behalf of the Russian Government by Capt. Behr, who will command the vessel, the propelling machinery worked admirably, and the water-tube boilers gave ample steam.

"The new armed steam transport 'Samoyed,' which has been built and engined by the Thames Ironworks and Shipbuilding Company, of Blackwall, for the Russian Government, underwent her official speed trials at the mouth of the Thames last month. This vessel, although designated a transport, has been more especially built and fitted for the purposes of the Russian Imperial hydrographical service, and has the following principal dimensions:—Length between perpendiculars, 170 feet; breadth, extreme, 33 feet; depth, from top of keel to underside of deck, 16 feet 7 inches; her loaded water draught being 12 feet, at which her displacement will be 1,055 tons. After a preliminary trial to see that everything was in order, the 'Samoyed,' having at the time a mean draught of 11 feet, left Gravesend an hour before noon, and proceeded down the river to the trial ground at the Maplins, when a series of consecutive runs were made on the measured mile, with and against the tide, it being about at the flood at their commencement, the mean speed attained on the first nine runs being a good 12½ knots. As the contract was for a trial of 6 hours' continuous running of the engines without stoppage, and a realised speed of ship of 11½ knots, the engines, which worked admirably, attained and kept up for nearly 7 hours a speed of 142 revolutions a minute, the greater part of the time being occupied in measured mile runs—after the first nine—at the different parts of the lower reaches of the river measured off for such purposes, the resultant mean speed attained over the whole of the running time being nearly a knot in excess of the contract, which was considered highly satisfactory. The propelling engines of the 'Samoyed,' constructed by her builders, are of the three-cylinder triple-expansion type, driving a three-bladed screw-propeller, the steam for them being supplied by two single-ended cylindrical three-furnaced boilers, made for a working pressure of 160 lbs. per square inch, which was maintained throughout the whole of the trials, during which the I.H.P. developed by the engines was 1,495, the vacuum being 28 inches. The internal fittings of the transport are thoroughly substantial and capable of enduring hard service, and her deck gear, which has been specially fitted for hydrographical purposes, includes powerful steam cranes, winches, capstans, and boat-hoisting gear (steam for driving which is supplied from an auxiliary boiler worked at 100 lbs. steam pressure), while, in addition to her ordinary boats, which are of specially strong build, she will carry amidships two powerful steam launches. The 'Samoyed' will be armed with eight Q.F. guns, four being 37-millimetre guns (two forward and two aft), and four 47-millimetre guns, two on each broadside."—*Times.*

UNITED STATES.—The American Press has been very jubilant over the rapid passage which the "Columbia" made from Southampton to New York. When all is said, however, it is clear that the vessel fell very far short of what was expected of her. The "Columbia" is one of the two so-called "Commerce-Destroyers" built for the United States Navy; she and her sister, the "Minneapolis," were designed to be able to run down the great American liners, and on their trial trips last year both vessels attained a speed of 22·8 knots when

pressed to their utmost. It was pointed out at the time, by some of the American papers, that this record had been exceeded by the "Yoshino" and others of the Elswick cruisers which had maintained 23 knots as a mean speed, and although the new Commerce Destroyers would be fast ships yet they would certainly prove no match for the Cunard and other Trans-Atlantic steamers when it came to a long run at high speed, and the late run of the "Columbia" would seem to prove this. The vessel left Southampton on Friday, July 26th, with orders to steam her best under natural draught, and to run the last twenty-four hours under forced draught, and she arrived off Sandy Hook at 9.35 a.m. on August 7th, having accomplished the distance in six days, twenty-three hours, and forty-nine minutes, an average speed of 18·41 knots. This, of course, is an excellent passage, and it is probable that no English cruiser at present could have done so well; but it would appear from Captain Sumner's report to the secretary of the Navy that the "Columbia" was on her last leg, when she arrived, and had a narrow escape of breaking down altogether.

The report says:—"With a smooth sea in the English Channel the ship made 18 to 19 knots an hour. With all the hatches on the forecastle down, considerable water came on board. The maximum roll was 19° to port, and 17° to starboard. The ship was steaming 17 to 19 knots an hour on an allowance of 200 tons of coal a day. At 12.10 a.m., July 27th, a tube blew out in boiler F, and the boiler was put out of use for seven hours. Wednesday, 31st—Fair weather for the most part, sea smooth and moderate. Leaky tube in top row, boiler E. It was plugged with wooden plug. Steam was sent through auxiliary main pipes. Other plugs were placed in leaky tubes. The vacuum was poor, and getting poorer, and the main condensers appeared to be greasy."

In closing his report, Captain Sumner says:—"It was not deemed practicable to make the last twenty-four hours' run under forced draught, because of the unreliability of the boilers (we were blowing out tubes at 140 lbs. pressure), the loose state of the engines from the long run, the great fatigue of the crews and above all, the impracticability of getting a coal supply to the boilers with sufficient rapidity, as the coal was located at this stage of the run. The run involved excessive labour on the part of most of the ship's company. There were twelve volunteers from deck on duty in the fire-rooms for the whole time, and forty-eight more men from deck have been employed below for some days in supplying the lower bunkers with coal from the wing passages."

The "Columbia" had on board, on starting from Southampton, 1,862 tons, of which she consumed 1,474 tons, having 328 tons on board when port was reached.

The Hamburg-American mail steamer "Augusta-Victoria," which left Southampton some six hours after the "Columbia," arrived at Sandy Hook 1 hour and 15 minutes behind her; the average speed of the "Campania" and "Lucania" is 21·5 knots an hour, or more than 3 knots faster than the "Columbia's" record; while the "Paris" and "New York" can maintain their 20·5 knots without difficulty; it is thus quite certain that all these vessels are quite safe from these two new "Commerce-Destroyers." And as the armament of both the "Columbia" and her sister is, relatively speaking, very light, it is doubtful if they are really as valuable units of a fleet as vessels of the "Royal Arthur" class, or the "Blenheim" and "Blake."

Re-forging armour plates in the method proposed by the Carnegie Steel Company promises to be a complete success. An experimental plate made by the company was fired at not long ago, at the Indian Head Proving Ground with very satisfactory results. It was a 6-inch plate which had first been forged to a thickness of 8 inches, after which it had been carbonised and then re-forged until it was reduced in thickness to 6 inches. A 6-inch gun was used in the test. The

first projectile—a Wheeler-Sterling armour-piercing projectile—was fired with a striking velocity of 2,100 feet per second. The result of the shot was merely to crack the plate slightly in the vicinity of the point of impact and form a bulge on the back of the plate about 20 inches in diameter. The head of the projectile was welded into the plate. The second projectile—a Carpenter armour-piercing projectile—was fired with the same velocity, and produced practically the same effect on the plate as did the first one, except that one of the radial cracks made by the first impact was extended to the corner of the plate nearest the point of impact. The test satisfied the officers of the Ordnance Bureau that the re-forged 6-inch plate is undoubtedly superior to a 6-inch plate which has not been re-forged, but an exact gauge of its value cannot be determined until more extensive experiments have been made. It is the determination of the Ordnance Bureau to ascertain just how much this experimental plate will stand, and it is probable that an 8-inch projectile will be fired at it in the near future. It is hoped that the result of these experiments will be such as to justify the department in making some reduction in the thickness of the armour to be put on future vessels, thus effecting a great saving in weight. In addition to testing the experimental plate the third lot of 13-inch semi-armour-piercing Sterling shells was also tested. These shells differ from the ordinary shells in that they are expected to penetrate a thickness of Harveyized armour equal to two-thirds of the calibre of the projectile without exploding the bursting charge. In the test a 13-inch shell was fired through a 7-inch nickel-steel oil-tempered plate without damage to the shell. It was deflected by the plate, however, in such a way that it struck the structure and broke in two. It was evident, however, that the explosive charge would have been carried through the armour. The Bureau of Ordnance has decided, however, that the shells are not quite up to the required standard, and the lot will not be accepted in their present condition, but will be re-treated, and will, perhaps, be softened and toughened so as not to be broken so easily as was the one fired in the test referred to.

A series of experiments were recently made at Indian Head, U.S.A., with a number of Driggs-Schroeder 6-pounder shells; some, supplied with percussion fuses, were fired at 1, 2, and 3-inch armour plates. It was found that in the case of the projectiles not fitted with fuses that they were exploded by the heat generated by their passage through the armour-plate, and acted as successfully as those supplied with the fuse.

Oval, instead of circular, turrets are proposed for the United States battle-ship "Iowa," and the question of shape is now before the Secretary of the Navy for decision. The inside diameter of the circular turret originally proposed was 26 feet. The dimensions of the oval turret would be 26 feet by 19 feet. The advantages claimed by the latter are:—Less surface exposed to the enemy's fire by 7 feet; better balance in the turret in heavy weather, and the possibility of increasing the port plates 2 inches in thickness, with a total decrease in weight. In other words, instead of a having a circular turret 15 inches thick, the side of the oval turret exposed to an attack can be made 17 inches thick.

The plans for the three first class torpedo-boats provided for by the last Naval Appropriation Bill have been completed at the Navy Department, been formally approved by Secretary Herbert, and advertisements for proposals for their construction will soon be issued. These boats will be a distinct advance in both size and speed over any torpedo-boats that have heretofore been designed by the department. Their displacement will be 185 tons, and they will be required to attain a sustained sea speed of at least 26 knots per hour. This displacement is 46 tons greater than that of the boats now under contract with the Columbian Iron Works. They are to be 170 feet long, beam 17 feet, draught 5 feet 6 inches, with all their stores and coal on board. Three torpedo-tubes will be mounted on the deck of each vessel in such a way as to give an all-round fire, and enable the torpedoes to be launched in any kind of

weather. In addition to her torpedo-tubes, each vessel will carry four 1-pounder rapid-fire guns. The engines will be of the vertical, inverted, direct-acting, triple-expansion type, and will develop 3,100-H.P. The boilers will be of the water-tube type. Electric lights will be fitted throughout the vessels. The high speed aimed at in these vessels necessitates the devotion of the greater part of the space below decks to engines, boilers, and coal-bunkers. But, notwithstanding this fact, Chief Constructor Hichborn has succeeded in giving them more comfortable and roomy quarters for officers and crew than any of the boats heretofore designed. The limit of cost on each vessel is fixed by Congress at $175,000, and it was provided in the Appropriation Act that one of them should be built on the Pacific Coast, one on the Mississippi, and one on the Gulf of Mexico, unless it should appear from the bids that any of the boats could not be built at a fair cost in the localities designated, in which event the President may authorise their construction elsewhere in the United States.

The Secretary of the Navy, Captain Cook, Chief Naval Constructor Hichborn, and Naval Constructor Taylor, lately witnessed a trial of fireproof wood for naval purposes, submitted by the Electric Fireproofing Company, of New York City. A piece of yellow pine, treated by the process, was placed in a furnace and subject to 1,000 degrees of heat for five minutes. During that time it failed to blaze, and when taken out was charred half an inch on each side. A piece of ash wood, treated in the same way, was subjected to the same degree of heat for twenty minutes, with practically the same result. It is probable that the Secretary will adopt this process for the Navy.

The new first class cruiser "Olympia" is to proceed to China from San Francisco to relieve the "Baltimore" as flag-ship on that station. During her final trials the ship maintained a speed of 19·5 knots for four hours under natural and of 20·4 under forced draught. It is stated that she is to make the best of her way across to Yokohama under natural draught without pressing, so her run will be watched with considerable interest, and in view of the late passage of the "Columbia" across the Atlantic some comparison will be made between the value of twin and triple screws.

The Government has completed on Sandy Hook, for the defence of the entrance to New York Harbour, a sunken mortar battery 500 feet square, enclosed by a counterscarp wall 20 feet high, having a ditch on the inside. Mortar pits are placed at each of the four corners of the earth embankment on the inside, each pit being furnished with four mortars. The pits are connected by subterranean galleries. These sixteen mortars, which are worked and fired by electrical devices, each throw a projectile weighing 1,000 lbs., with a charge of 80 lbs. of powder, a distance of over six miles.—*Army and Navy Journal* and *Scientific American.*

MILITARY.

THE SELECT COMMITTEE appointed to inquire and report what results have followed upon the Recommendations made by the Select Committee of 1876-77 for the Employment of meritorious Soldiers, Sailors, and Marines in Civil Departments of the Public Service; and to inquire whether any, and, if so, what further measures are desirable for the purpose of extending the employment of this class in those Departments, and also for helping them to obtain service, to such extent as they may be fitted for it, with private employers of labour;———

HAVE agreed to the following REPORT:—

YOUR Committee were first appointed on the 13th June, 1894; but on the 3rd August, 1894, finding that they had not time to conclude their inquiry, they recommended being re-appointed in the Session of Parliament then next ensuing

This was accordingly done, and this Report is therefore the result of the two inquiries, 1894 and 1895.

Dealing first with what may conveniently be called the historical part of the reference, your Committee find that the Select Committee of 1876-77 recommended, *inter alia* :—

(*a*) That the appointments of permanent messengers, for which "soldiers and sailors appear especially suited," should, for the future, "be exclusively made from persons who have served."*

(*b*) That "with reference to civil appointments made under the system of open competition, and for which soldiers and sailors are deemed to be suited, great care should be taken so to adjust the conditions of examinations as to give fair weight to those branches of knowledge in which their training has especially enabled them to make progress."†

(*c*) That, in connection with the above, "the conditions as to age and marriage, should also be carefully reviewed in some cases. If, for instance, the rule, that the superior limits of age may be extended in proportion to the period of a soldier's service, applies to a particular class of civil employment, it is manifest that in such cases the rule excluding married candidates should also be relaxed."‡

The Select Committee, in making these recommendations, desired it to be understood that, "while mainly referring to the Army," they also wished to recommend "that similar advantages should be given to the marines, and also, where practicable, to sailors."§ And the report, to which your Committee have thus referred, concludes with this paragraph :—

"Your Committee, in conclusion, desire to express their earnest hope that the recommendations which they have made, and the evidence on which those recommendations are based, will be taken into consideration by the departments concerned, with as little delay as possible."

Nearly eighteen years have elapsed since the above was written ; and several changes of Ministry have taken place during that period. But it does not appear to your Committee, after carefully inquiring into the subject, that the results have been, on the whole, commensurate with the necessities of the case.

Of the various Public Departments which have had the means of complying with the recommendations referred to, the War Office and the Admiralty have, as might have been expected, been foremost in attempting some change of policy for the benefit of soldiers and sailors.

The Treasury has, from time to time, taken important action in the same direction ; and the civil community at large, stimulated by the action of the War Office, of the county and military authorities in the regimental districts, and of some of the great railway companies, has of late years taken up a more liberal and public-spirited attitude on the question.

In 1883, the Treasury appointed a Committee, which reported in favour of employing Army and Navy pensioners in the outer and unclerical branches of the Civil Service.

In 1891 the same Department reported, with regard to the appointment of office-keepers, messengers, and others, in a sense favourable to retired soldiers and sailors. But until March, 1894, the Treasury had only issued minutes giving their sanction, as an experiment, to the employment of Navy and Army pensioners as "temporary messengers in Public Departments," but expressly signifying that such employment "would not be given exclusively to soldiers or sailors."

* Report of Select Committee, 1876-77, para. 11.
† Report of Select Committee, 1876-77, para. 20.
‡ Report of Select Committee, 1876-77, para. 21.
§ Report of Select Committee, 1876-77, para. 22.

In 1884, the War Office Authorities gave instructions that each regimental district should keep a register for assisting reservists and discharged soldiers to find employment; and a small subsidy was soon afterwards granted to the National Association.

In 1892, a meeting of representatives of the principal railway companies took place at the War Office, under the presidency of the Under Secretary for War, when the question of employing more soldiers and sailors was discussed. Very useful and gratifying action was afterwards taken by some of the great companies, whose co-operation had thus been invited.

Meanwhile, in 1891, the Postmaster General introduced a system having a most important bearing on the problem of finding State employment for reserve and discharged soldiers.

With the sanction of the Treasury he made a regulation that telegraph messengers, in order to become postmen, should first serve for five years with the colours. At the age of 18 they were to be encouraged to enlist, and when they returned to the Department as postmen, half their military service was to count as Post Office service for the purposes of pay. On the death of Mr. Raikes, his successor in office gave his adhesion to the same plan. The scheme, however, had only a prospective application, and was eventually abandoned before it had in fact come into operation.

While it appears that for some years the Post Office has given employment to a certain number of ex-soldiers and sailors, it would also seem that with the exception of the proposals of 1891, referred to in the preceding paragraph, the only systematic effort to employ such persons in this department is to be found in the regulations which concede certain advantages to ex-soldiers and sailors when applying for appointment as postmen or porters in force since 1892. But these regulations expressly stipulate that telegraph messengers who have not served in the Army or Navy, and indeed any person who may be employed, even temporarily, in the postal department, shall enjoy precedence over ex-soldiers and sailors in the matter of selection.* It is also the case that telegraph messengers who enlist in the Army are still allowed to count half their Army service as service with the Post Office should they return to it. But these would appear to be the only aids which the Post Office gives to the naval and military authorities in finding employment for ex-soldiers and sailors.

In 1885, the National Association for the Employment of Reserve and Discharged Soldiers was established. This organisation has its headquarters in London, and branch or district associations in nearly every part of the country. Entirely due, in the first instance, to private enterprise, the Association has, in the last few years, received increased recognition and assistance from the State, and has exercised, your Committee believe, a most beneficial influence in providing retired soldiers with employment, and in persuading the civil community to regard these servants of the State from a more just and patriotic standpoint.

From the above historical survey of the matters under consideration it will be seen that, although occasional attempts have been made to carry out in the spirit rather than the letter, the recommendations of the 1876-77 Committee, the State has not yet adopted any sufficient and continuous policy for the employment of reserve and discharged soldiers; the most important movement in that direction having been the result of private enterprise.

Your Committee regard this condition of things as much to be regretted. They believe that, by annually sending some 16,000 or 17,000 reservists back from the colours into civil life, the State contracts towards these men a moral obligation which it should not hesitate to discharge. They enlist at exactly that period of their lives when they might otherwise be learning what would be most

* Appendix, No. 4, Memorandum by the Postmaster General.

useful to them as mechanics, as craftsmen, or in other civil vocations. They have lost many opportunities for establishing connections and interest; they have saved the rest of the community from the inconvenience and hardship of universal service; and, for a small retaining fee, they have undertaken to return to military life whenever called upon.*

Employment in different Government Departments may, to a certain extent, be looked on as employment in different capacities under one master. An employer of labour, in order to obtain the best men for his work, must very often go outside the circle of his employés; but everyone will admit that they, as a rule, should have the first claim for his consideration. In the same way vacant places in Government offices should be given by preference to those who have previously served in the same or in some other Government service, though to this rule there must be exceptions more or less numerous. No one can, your Committee think, complain at the sailor and the soldier receiving this amount of consideration with regard to civil employment under the Crown. The foregoing considerations, your committee believe, make up, on behalf of the Army reservists and discharged soldiers and sailors, a claim to specially favourable treatment at the hands of the Government.

As regards all soldiers, the tendency, hitherto, would seem to have been to regard them as a peculiar class of men segregated from the rest of the community; and although the short-service system, coupled with the spread of education, has done something to correct this impression, your Committee are of opinion that it would at once greatly popularise service in the Army, and improve the status of the soldier, if serving with the colours could be made, under ordinary circumstances, a condition of appointment for employment in the Departments of the public service; civilians being thus encouraged to regard military service as the avenue rather than the obstacle to civil employment under the Crown.

Your Committee regret that the experiment of passing a certain number of telegraph messengers through the military service appears to have been considered impracticable. They are, however, strongly of the opinion that every inducement should be held out to telegraph messengers to pass through the ranks, which hardly appears to be the case at present. The success of this recommendation must depend on the cordial co-operation of the Post Office and the War Office, and the exact steps which should be taken can hardly be indicated by your Committee. But the Committee think that in any case those telegraph messengers who have enlisted should, on passing into the reserve with good character, have the very first claim to employment, above all others.

Returning to the more general aspect of the question, your Committee heard much evidence as to the suitability of soldiers, sailors, and marines, for employment as policemen, prison warders, caretakers, timekeepers, watchmen, storemen, etc., etc. The general testimony was strikingly favourable as to the satisfaction given by ex-soldiers and sailors in the capacities thus enumerated; and although one police witness expressed the opinion that army training tended to make a man lose his individuality to an extent which might interfere with the due discharge of the duties of a country constable,† the evidence given on behalf of the Metropolitan Police,‡ as well as the information supplied to your Committee by the other great cities, to which application was made, is unanimously favourable to the ex-soldier and sailor.§ As park-keepers, too, they appear to give general satisfaction, and your Committee is glad to understand that this class of situation in connection with the royal parks, is now, practically speaking, set apart in favour of those who have served.

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* *Vide* Section 12, Reserve Forces Act, 1882.

† Chief Constable of Staffordshire, 1032.

‡ Superintendent Davis.

§ Appendix No. 3, Manchester, Liverpool, Glasgow, etc., etc.

The retired sailor, it would appear, gives more satisfaction than the soldier, and finds it easier to obtain civil employment, in such branches of work as building and scaffolding, or service with the Fire Brigade. The soldier, on the other hand, has very few opportunities, either of learning any new kind of work, or of keeping himself practised in what he may have been taught before joining; and your Committee would suggest that, in the winter months especially, and subject always to the paramount duty of maintaining their military efficiency, soldiers might be given some further encouragement than that which they at present enjoy in attending any courses of instruction, including those of the National Schools of Technical Education, by which they would be likely to benefit after their term of service with the colours shall be completed. Your Committee would also recommend the further and more frequent employment of soldiers in all industrial work incidental to their daily life and calling.

To return to the question of employing ex-soldiers, more especially non-commissioned officers, in the police: While anxious not to fetter the discretion of the local authorities in selecting whatever men may seem to them best fitted for the special duties they may have to perform, your Committee believe that the example of the Metropolitan Police in reserving a definite proportion of appointments for retired soldiers and sailors, might well be more generally copied. From a return supplied by the town clerks of the cities of Manchester, Liverpool, Glasgow, and Sheffield, it would appear that much is being done in those important centres in the same direction;* and your Committee are convinced that every possible means should be taken to bring to the notice of the proper local authorities, through the officers commanding regimental districts, and by all other legitimate means, the desirability of helping to solve what has become a national problem.

The importance of stimulating the employment of ex-soldiers and sailors in other than official capacities should be prominently kept in view; and your Committee consider that the National Association for the Employment of Reserve and Discharged Soldiers, as it is at present constituted and managed, and local authorities as well as private employers, should receive all possible encouragement from the State. Your Committee also recommend that all necessary steps should be taken to ensure the absolute reliability of all documents purporting to be the "characters of reserved" or discharged soldiers.

Your Committee heard some evidence as to the unsuitability of ex-soldiers for employment in some of the more laborious forms of manual work, and your Committee would point to the interesting and valuable evidence of the General Manager of the Great Northern Railway Company, as accurately indicating the special branches of civil employment for which soldiers are apt to prove unsuited.†

Your Committee recommend that every soldier or sailor, upon discharge or retirement to the reserve, should be given a printed paper setting forth in plain language the civil appointments for which he is eligible, the conditions which he must fulfil, and the person or persons to whom or through whom any application of his should be made.

Your Committee heard so much as to the evils of paying pensions quarterly as to be convinced that a discontinuance of that system is needed. They recommend that, wherever it may be practicable to do so, the pay or pension of an ex-soldier or sailor shall be included in, or added to, his weekly wage, and handed to him at the same time; and they are glad to learn that this practice is already in operation in one Department of the Post Office, and that an extension of the arrangement is likely to be favourably considered and facilitated by the War Office.

The evidence given before your Committee shows that there are many men in the Army well qualified, on leaving the colours, to perform clerical work such as

* Appendix, No. 3.

† Sir Henry Oakley.

is now allotted to the "abstractor" class in the public offices. It is clear, however, that in the competitive examinations upon which clerks of this class are appointed, such men compete at a disadvantage with younger men, whose education has more recently been finished, and who, in many cases, have had practice in doing examination papers. Their inferiority as competitors in an examination does not, in the opinion of competent witnesses, indicate any corresponding inferiority in education, in intelligence, or in fitness for the work of this branch of the public service. Your Committee, therefore, recommend that the experiment should be tried of reserving a certain number of appointments of this class for competition among soldiers leaving the colours, subject to the existing limit of age, which would at present apply in their case, and subject also to the successful candidates passing a standard to be determined by the Civil Service Commissioners. Your Committee are of opinion that this could be done without risk to the efficiency of the public service, and that it would be likely to increase the attractions of the Army for young men of intelligence and fair education. Your Committee believe also that the same considerations apply to the Second Division of the Civil Service, and they recommend that a small number of vacancies in the Second Division should be reserved for the competition of holders of First Class Education Certificates among themselves, as is now done in the case of boy clerks in the Government Offices under the Order of 1876. It has further been urged upon your Committee, that in the case of all appointments in the public service for which reserve soldiers are likely to apply, and for which there is a qualifying non-competitive examination, the possession of a Second Class, still more of a First Class Army Education Certificate, should excuse competitors from further examination. Whether this suggestion can in practice be adopted is a question for the Civil Service Commissioners, but your Committee earnestly commend it to their consideration, and believe that, if it is found possible to adopt it, it will act as an inducement to reserve and discharged soldiers to apply for some situations for which they are well fitted.

Lastly, your Committee recommend that the recommendations of the Select Committee, 1876-77, as regards permanent messengers, should be forthwith carried into effect; and that with regard to civil appointments for which soldiers and sailors of superior education may be suited, a definite proportion of such places should be reserved, and considerable latitude as to age, and rules as to marriage, and conditions of examinations, etc., given to those who have been serving the State, at sea or with the colours.

The Report of the Select Committee of 1876-77, made nearly twenty years ago, dealt mainly with the problem how, in finding civil employment for soldiers and sailors, that particular portion of the community might derive some benefit. But your Committee are of opinion that since that period, during which the short-service system has been fully developed, and the labour difficulty has greatly increased, the question has become a much larger one. All authorities are agreed that nothing tends so much to popularise service in the Army as a knowledge on the part of those who serve that they will not find themselves stranded and unable to find work at the end of their military career. And in view of the growing demand for higher wages, side by side with the existence of purely voluntary service, your Committee believe that the recommendations they have now made, if carried out in their integrity, will not only increase the self-respect and efficiency of the soldier, but will also be of great advantage to the State and to the country at large.

27th June, 1895.

REPORT ON THE CURRAGH DISTRICT MANŒUVRES, 1895.

The report on this year's manœuvres at the Curragh is full of interest, and shows the great improvement that has taken place in the tactical efficiency of the troops in the Irish command during recent years.

On the subject of marching the Major-General Commanding the Curragh District remarks:—"Our soldiers are seldom called upon in peace manœuvres to perform anything like the distances marched by Continental troops. The Austrians cover on occasions 20 to 28 miles a day; Hungarians, 19 to 27; Germans, 20 to 25; French, 24 miles (but on an average only 15). I was anxious to prove that, with proper training, our men can, without undue distress, perform similar work. The preliminary training of the infantry of the Curragh commenced in June. During this month minor operations were carried out. In July the operations were on a more extended scale, entailing a considerable amount of marching. These operations took place three times a week. Although the month of July was a wet one, there was no cessation of work owing to weather; nor has there been any cancelling of parades for any cause during the year's work. From this preliminary work the Curragh infantry were in hard training before commencing the manœuvres. The Dublin troops had also received careful preparation by route marching. The results of this training may, I think, be considered decidedly good. The average distances covered on marching days were—Western Force, 16 miles; Eastern Force, 15¾ miles; the longest marches being 20 and 24 miles respectively, the former being twice covered. On manœuvring days the average distances marched were—Western Force, 12·6 miles; Eastern Force, 14·6 miles, the longest being 17 and 18 miles respectively. Judging from these results, and from the apparent ease with which the work was accomplished, especially at the end of the manœuvres, it appears to me that our men are not in this respect so far behind the Continental soldier as some critics would have us believe. That a small percentage of men were unable to march with their battalions on certain days I admit (the return Appendix R shows the number), but this was due to sore feet resulting from badly-shaped boots and the chafing of leggings, and not from want of stamina.

"The machine-made ammunition boot certainly is radically defective; the leather is too stiff and hard, whilst the rigid sole allows of no bend in the ball of the foot. All boots worn by the Curragh troops were dubbed for a month before starting on the manœuvres. We should either reject recruits who have feet that cannot be fitted by any existing size of army boot, or we should allow a certain proportion of men to have boots specially made for them, a course I strongly recommend. Nothing can be said in favour of the regulation legging, it is a complete failure, and it cuts the leg as well as causes heel galls. Boots and leggings are more fully reported upon under the heading of 'Dress,' to which I particularly invite attention."

Light Service Order.

"I expressed an opinion after last year's operations that it appeared to be of very doubtful benefit to the service to train the men to carry heavy kits.

"I believe that our great object in having manœuvres is to prepare our troops for active service. It seems to me, therefore, to be most desirable that some more definite ruling should be given than appears in the 'Manual for Field Service, Infantry' as to whether our men will then carry the valise or the Light Service Order. I am of opinion that the Light Service Order, if a pair of canvas shoes is added to the list, provides all the articles absolutely necessary for a soldier to carry, and that the valise is not required, or certainly not for service. Such articles as have to be forwarded to the regimental depôt established at the base of operations will be far better packed in the kit bag; the emergency ration would

have to be carried by the man. The articles carried by and for the soldier during the recent manœuvres are enumerated on page 2, Appendix A-1. The total weight carried by the man being 37 lbs., and articles carried for him in the kit bag weighing 11½ lbs. To the latter list, for the wet climate of Ireland should be added in future a second pair of boots, which would raise this weight to about 15 lbs. Canvas shoes, which were provided under regimental arrangements, were much appreciated by the troops; these were carried by the man inside the rolled great coat, and as they are constantly required to be worn immediately on reaching camp after a long march, I consider that they should thus be carried by him.

"The marching of the infantry was decidedly good, as is proved by the small total number carried in the ambulances, viz., 54 for the Western Force, and 56 for the Eastern Force. This number absolutely shows the whole of the men who fell out, for no men were allowed to fall behind their unit without having an order for admission to the ambulance, and there was positively no straggling on any day. A large proportion of the number carried in ambulances was due to accidents from marching over rough country."

From the remainder of the report the following extracts are made, which, it is hoped, will prove useful to the readers of the JOURNAL: —

General Tactical Conduct of the Operations.

"I endeavoured to correct before the manœuvres commenced the tactical errors which have been most prominent in recent years, and with this object issued the memorandum that appears as Appendix E to this report. The memorandum was carefully studied by all ranks, and many of the mistakes that are therein alluded to were thereby avoided.

"The grave fault of insufficient reconnaissance was less frequently committed, and on most days this duty was carefully carried out before any important movement was attempted.

"On no occasion were the troops disseminated by undue extension of front. The forces were kept well in hand, and were worked in first, second, and third lines.

"Fire discipline was good, and fire was not opened by the attack until within about 800 yards of the position to be attacked, except on the 8th inst., when long-range volley firing was directed by infantry on guns at a range of 1,500 yards.

"The difficulty of keeping up communication with troops making a flank attack when isolated from the main body, and the accurate timing of that attack, was well exemplified on one occasion when I had intended to keep up communication by signal, the intervening country being much cut up by cultivation, and owing to wire, impossible to ride over. The rain, however, fell so heavily that, at a critical time, signalling was interrupted, and, as a matter of fact, communication was practically lost.

"A much greater effect of fire was obtained than in previous manœuvres, by making the firing line more dense at the outset, and sufficient rifles were brought up to give superiority of fire to the attack before pushing to decisive ranges. I consider that supporting lines are best absorbed earlier than was formerly the practice. To be of any use as supports they must of necessity follow, before absorption, somewhat closely on the firing line, and they are then liable to suffer from the fire directed at it, whilst during this time the value of their rifles is, of course, lost to their own side.

"I particularly drew attention to the principles laid down in 'Infantry Drill,' part V., viz. :—that an absolute essential to success is the assembly of the second line in several lines deep opposite that point selected for assault; the said point to be taken at all cost. Depth opposite the point of assault has in previous years been much disregarded, and the swarms of men required to be loosed at

the moment of assault have thus not been forthcoming. The fault was at times committed of loosing this swarm at too great a distance from the enemy's position, and before the most intense fire had been directed at it from about 200 yards distance. Containing lines, on the other hand, were pushed on too rapidly, and established themselves at too close a distance from the position to be attacked, thus entailing loss, which, to a great extent, might have been avoided had more time been given for the approach of the assaulting troops, or for the turning movement to make itself felt.

"On more than one occasion a position was assaulted, whereas the nature of the ground lent itself to a turning movement, which would have forced the defenders to retire with a comparatively small loss of life to the attack. The necessity of absorbing the attention of the defence along the whole front, and then bringing an overwhelming force to bear on the weak point, appears to have been better grasped in the later operations."

Cavalry.

"The ground worked over afforded very practical instruction to the cavalry. Had it not been impossible, on the score of expenses, to increase the strength of this arm, there appeared to be scope for employment of larger units; but the small force engaged received great credit for zeal and enterprise in the manner in which it worked. The men gained much useful experience in working over an unknown country, and their riding was greatly improved by their having to get over the numerous obstacles encountered. These being mostly loose stone walls did not prevent cavalry from working fairly rapidly over the ground, and the reconnoitring parties did most excellent work. I cannot too highly praise some of the reconnaissance reports that were sent in accompanied by neat and accurate sketches of the enemy's positions.

"The squadrons of the 10th Hussars and 12th Lancers were made up of four troops, one troop, together with its troop officer, being taken from each squadron of the regiment. This arrangement answered well, there was much emulation between the troops, and it ensured that parts of each squadron gained the valuable experience of the manœuvres.

"In these days of wire fences I strongly recommend that wire cutters should form part of the equipment for cavalry and artillery; a certain number being issued to each troop and battery.

"It is gratifying to remark that the faults I pointed out in my report on last year's manœuvres were not again repeated. The newly approved field form for cavalry reports was used, and answered admirably; the envelopes supplied with the book were also a great success, and are most essential in wet weather."

Artillery.

"Speaking generally, the handling of the artillery throughout the manœuvres was excellent, and the driving was all that could be desired. The nature of the manœuvring ground, offering as it did a succession of extremely favourable artillery positions, afforded valuable practice for all ranks. The ground generally was simple for wheeled artillery; but the necessity of making detours to avoid crops, and also of effecting openings for the passage of the guns, caused at times some delay in taking up positions which may have occasionally made the movements of the artillery appear somewhat slow; that but little real delay took place was in great measure due to the fact that the O.C. Brigade Divisions, going well in advance of their commands, reconnoitred the most favourable lines of advance, and had such gaps prepared in banks and walls as may have been desirable.

"Large numbers of spectators also were apt to assemble at all the points of vantage, on or in the immediate vicinity of the positions occupied by the troops, especially near the guns, and by so doing rendered it difficult for the commanders to observe the exact moment at which such changes in the situation took place as would render a corresponding movement on the part of the artillery desirable.

"Gun signals to denote the target were again employed, and the system, of which I am much in favour, worked, I think, to everyone's satisfaction. I not only claim for gun signals that the attention of the different arms is at once drawn to the branch of the service being fired at, in a manner that the mere display of a screen (even if visible) can never do, but I am also advised that they are distinctly beneficial to the 'Fire Tactics' of the artillery themselves, for they at once disclose to the superior artillery commanders, and to the umpires, certain errors which artillery officers are liable at times to make, such as frequent changes of target, and 'wrong objective' in the various stages of attack and defence. It appears, however, that the signals we have hitherto used, viz., one for cavalry, two for artillery, and three for infantry, are somewhat incompatible with the working of a battery by its sub-units; consequently, I would propose next year to adopt instead, one gun to represent artillery, two to represent infantry, and four cavalry, the latter being the arm which as a rule is the least fired at in manœuvres. The fire can then in each case be under the control of a section officer.

"From an artilleryman's point of view the depth of the formations adopted by the infantry when advancing has been criticised. Artillery officers are, however, apt to forget that one side must attack and the other defend, and that if the attacking artillery obtains that superiority of fire which is an essential preliminary to the infantry advance, the latter should suffer but little loss from that of their opponents. If the principle inculcated by the drill books is correct, the attacking infantry should, under normal conditions, have only to fear defeat from one or both of two causes, viz., the defender's infantry fire, and counter-attack; consequently infantry commanders when about to advance to the attack of a position, naturally assume that formation best suited to meet those dangers. Should the attacker's artillery fail to silence that of the defence, it is questionable whether any advance at all on the part of the infantry is possible; an undue burden is in any case placed upon their shoulders; but even when advancing under these disadvantageous conditions, should they adopt those extended formations which some appear to advocate, they will, in my opinion, be liable to be destroyed by a well-delivered counter-stroke, and it is not impossible that they may fall a prey to an enterprising cavalry; besides this, should they eventually arrive within assaulting distance of the point selected for attack, they can never, if extended on a wide front, be in sufficient strength to bring the issue to a successful conclusion.

"In peace manœuvres umpires as a rule fail to emphasise these points, by permitting a defender's artillery to remain in action long after it would have been obliged to withdraw had it been actually engaged with a preponderating artillery."

Infantry.

"The general bearing and marching of the men left little to be desired, and their cheerful endurance of considerable discomfort was constantly remarked upon.

"In action the leading of the company commanders was excellent, each and all co-operating in a most intelligent manner towards the common end, and on no occasion was a battalion commander observed interfering in an unnecessary manner with the initiative of his subordinates.

"Mistakes were certainly made, such, for instance, as portions of a containing line pressing in too close to an enemy's position, or a firing line advancing by rushes at too great a pace. When retiring, troops were at times seen to halt on the obverse slopes of hills when, had they continued for a short distance urther, ample cover could have been obtained behind the reverse slope. On one occasion, indeed, there appeared to be some want of system when withdrawing troops engaged at close range.

"The necessity of giving infantry practice in moving over an enclosed country was shown by the fact that, on some occasions, companies which should have

been in line were observed advancing under fire in a formation analogous to file or fours; this was due to the company commander having permitted those men who were the first to traverse a bank or hedge (it was rare that more than two or three men could get over at a time) to move forward at their usual pace, before the remainder of the company had had time to close up and regain their original formation in line.

"Particular attention was drawn to all these points during the manœuvres, and distinct improvement was noticeable before the close."

Cyclists.

"This year again cyclists were of the greatest value as orderlies; without them the duty thrown on cavalry would have been heavy, owing to the distance between the different camps. I can only repeat my recommendation of last year, that a certain number of trained cyclists should be acknowledged in each battalion, and that a grant should be made under certain conditions to each cyclist on the establishment; to my mind they are invaluable for orderly duty. The money allowance would be small in comparison to the keep of a horse, and more work can be done by one cyclist than by several mounted orderlies (an orderly at Glashare covered 62 miles during one day, taking messages); on the march they are also very useful in keeping up communication between the various units.

"The machine principally used during the manœuvres was the 'Swift,' a really good serviceable roadster, weighing from 35 to 38 lbs.; many of them had been in constant use for two years. This machine is supplied to regimental cycling clubs at 10s. per month, becoming the property of the hirer in two years and eight months.

"One officer and twenty-five men were selected for the duty, the men being paid at the rate of 1d. per mile; each cyclist was provided with a book in which were entered all journeys performed by him, the entries being vouched for by the signature of the officer who sent him. These books were examined daily by the officer in charge, and the entries posted up in a book kept by him. The total mileage recorded by cyclists during the manœuvres was 8,285½ miles, an average of 331·42 miles for each man."

Machine-Guns.

"One battalion with the Western Force had two Maxim machine-guns, and the 2nd Rifle Brigade supplied two for the Eastern Force; the cavalry with the Western Force also had a machine-gun (unfortunately not of the latest pattern, as the Maxim could not be mounted on the carriage in possession of the unit).

"The infantry managed to take their guns over very rough, difficult country, and were not stopped by enclosures, even of the formidable nature that were met on 8th August. Considerable intelligence was shown in selecting positions and in working the guns, but as a continuous fire is not possible with blank cartridges, no proper idea of intensity of fire can be formed. I again recommend that the number of these guns now allowed to a brigade may be increased."

Fire Discipline.

"Fire discipline of all arms showed a marked improvement. The infantry had a far larger amount of ammunition at their disposal (under the conditions above described) than has been available in previous manœuvres, but our training renders captains and sectional commanders so careful in husbanding blank ammunition at field days, when the allowance is very limited, that, notwithstanding the increased supply, it was found that intensity of fire was never developed. The amount of ammunition expended was:—

	Western Force.	Eastern Force.
Artillery	676	419
Cavalry	1,862	2,874
Infantry	91,197	57,081

the Western infantry averaging 40·59 rounds per man, or 5·8 per day; the Eastern infantry averaging 28·54 rounds per man, or 4·8 per day.

"I do not consider this result quite satisfactory as regards the infantry; I think a better training could have been carried out by a more liberal use of ammunition. With smokeless powder, however, it is impossible to see at any distance what unit is actually firing, neither is it apparent how many rifles are being discharged at one time by any unit. From a knowledge of these facts, and in order to avoid running short of cartridges at a critical moment, there was a strong tendency to allow only a few men to load, the remainder merely snapping."

Health of the Men.

"In spite of the inclemency of the weather there was very little sickness amongst the troops.

"In all 164 officers and men, a percentage of 2·5, were transferred to station hospitals, 35 from the Western Force, a percentage of 1·1; 128 from the Eastern Force, a percentage of 4, and 1 from Foyle House. It should be remembered that a portion of the Eastern Force was six days longer away from quarters than the rest of the troops, and further, medical statistics show that as regards general health, Dublin cannot compare with the Curragh, and that the relaxing climate of Dublin is not calculated to assist in getting men into hard condition. Only 14 cases in all were admitted to hospital from disability which could in any way be attributed to exposure to bad weather.

"There were 20 cases of venereal and 16 of accidents, the majority of the latter being strains. The only serious accident was a fractured clavicle, the result of a fall from a horse.

"The following is an extract from the senior medical officer's report:—

"'In conclusion I would add that, considering the almost constant rain, the long marches performed by the men and the difficulty they had in getting their things dried, the small number of sick, 2·5 per cent. for the whole force, is most remarkable.'

"A return of sick by corps is below:—

Western Force.		Eastern Force.	
Corps.	Officers, N.C.O's & Men.	Corps.	Officers, N.C.O's & Men.
Royal Horse Artillery	3	Royal Artillery	1
10th Hussars	2	2nd East Kent Regiment ...	18
2nd East Yorkshire Regiment...	3	1st Oxfordshire L.I.	25
1st Yorkshire Regiment ...	8	1st Derbyshire Regiment ...	31
1st Lancashire Fusiliers ...	6	2nd North Lancashire Regt.	10
2nd Hampshire Regiment ...	9	2nd North Staffordshire Regt.	42
1st Royal Munster Fusiliers ...	2	2nd Rifle Brigade	1
Army Service Corps	1		
Total	34	Total	128
Royal Engineers (Foyle House)	1		

The March of the 2nd Bn. the Devonshire Regiment through the County of Devon.

By Captain H. H. BEDINGFELD, Adjutant 2nd Bn. Devonshire Regt.

WHEN, in August, 1895, the 2nd Bn. Devonshire Regiment, then stationed at the Citadel, Plymouth, was ordered to Pembroke Dock, it was decided that the battalion should, on change of station, perform the greater part of the journey by route march through its own country.

The battalion, consisting of eighteen officers and 714 rank and file, marched out of the Citadel Barracks at 9 a.m. on the 7th August, accompanied by the bands of the Plymouth Division Royal Marines, the 2nd Bn. Somersetshire Light Infantry, and the 2nd Volunteer Battalion of the county regiment. The route selected lay across Dartmoor, through Moretonhampstead into Exeter (where the depôt is situated); thence through Crediton, Eggesford, and South Molton to Barnstaple; and lastly to Ilfracombe, where the battalion was embarked on a steamer and conveyed to Pembroke Dock. The following was the itinerary:—

DATES.	FROM.	TO.	MILES.	ENCAMPMENT.
7 August	Plymouth ...	Dousland	11	Yennadown Down
8 ,,	Dousland ...	Postbridge	9	Post Bridge
9 ,,	Postbridge ...	Moretonhampstead ...	8½	Court Park
10-11 ,,	Moreton ...	Exeter	14	Militia Field
12 ,,	Exeter	Crediton	10	Blagdon Farm
13 ,,	Crediton ...	Eggesford	13½	Ford Farm
14 ,,	Eggesford ...	South Molton	13	Recreation Ground
15 ,,	South Molton ...	Barnstaple	11	Sports Ground
16 ,,	Barnstaple ...	Ilfracombe	10½	Hillsborough
			100½	
17 ,,	Ilfracombe to Pembroke Dock 65 miles by steamer.			

The transport was provided by a private firm (Messrs. Turpin and Sons, of Plymouth) and was found to be most excellent, the wagons were large and roomy and very well horsed. The distribution was as under:—One wagon to each company, one for quarter-master stores, one for officers' personal baggage, etc., besides which there were two water carts and one ambulance, all horsed by Turpin and Sons. A spare empty wagon followed the ambulance. This was intended to carry the equipment of any weakly men, and was found very useful.

It will be seen that the total distance by road amounted to 100 miles, which was accomplished in nine marches, giving an average of about 11 miles *per diem*. The battalion marched continuously, with the exception of the Sunday, which was spent at Exeter, and the average rate of marching throughout was 3 miles an hour, exclusive of halts. The longest distance covered in one day was 14 miles over a very hilly country (from Moretonhampstead to Exeter). It was expected that this march would try the men considerably, but they stood it very well, only nine falling out. The regiment was most hospitably entertained at Exeter, where it was met by a detachment of the Royal Artillery, and by the bands of the 4th (Militia) Battalion Devonshire Regiment, the Royal 1st Devon Yeomanry, and the 1st Devonshire Artillery Volunteers. There was no weeding-out process before starting from Plymouth, only those who were actually sick, and some few who had to be left for fatigue duties, proceeding by train: the men, therefore stood the march very well.

Considerable intervals were allowed between companies when marching, which benefited the men considerably. It gave elasticity to the column, and prevented those checks which would otherwise occur when one part of a column is going up a hill while another is going down, and thus involving an alteration of pace and cadence. Each company marched its own pace and step, and sang its own songs. We carried the whole of our camp equipment and personal baggage with us, and so had to pitch, strike, and pack our camp daily.

The actual articles each man carried were:—Serge, trousers and boots, helmet, leggings, haversack, mess tin, water-bottle, valise, waistbelt and frog, braces, 2 pouches, bayonet and scabbard, rifle, and great coat carried on the waistbelt at the back. Contents of valise: 2 brushes, 1 cap, 1 cape, 1 holdall complete, 1 pair mitts, 1 pocket ledger, 1 shirt, 1 pair socks, 1 towel and soap, 1 tin dubbing.

The actual weight carried by each man was as follows:—Valise equipment complete, together with rifle, bayonet, water-bottle, helmet and haversack and leggings (valise being filled as shown above) 36 lbs.; allow 3 lbs. for miscellaneous contents of haversack and about 6 lbs. for boots and clothes the men stood up in, making a total of 45 lbs., to which should be added some 5 lbs. additional weight caused by the soaking rain.

The weather generally was very bad. It frequently rained hard when the men were pitching tents, and on other occasions they arrived in wet things which they were compelled to wear; these discomforts were, however, cheerfully borne. The men's clothing suffered considerably, owing to the excessive wet. About half the value of a new serge and pair of trousers, say 10s., would about represent the damage to each man's kit. But from a marching point of view the rain was perhaps more agreeable than heat and sun. The coolness of the air and the absence of dust were far more favourable for marching.

The men of the battalion are very young, but their behaviour, despite the many temptations to which they were subjected, was most satisfactory. They bore the march very well indeed, and showed considerable spirit and determination; indeed, often maintaining their places in the ranks when they were evidently suffering considerable discomfort if not pain. The average number of men who fell out was nine each day; of which number seven fell out from sore feet, and two from fatigue. But in many instances the same individual men fell out each day. Six men were sent in by train to hospital. The remainder completed the whole march.

The ammunition boots were found to be satisfactory, though there were complaints of their stiffness at the back. "Waukphar" was freely used, and proved very beneficial. No fault was found with the leggings, but the brown ones recently issued are much preferred. The band and drummer boys of the battalion stood the march well, and made no complaints either of the leggings or boots. They carried no valises, and only haversack, water-bottle, and cape *en banderole*.

Nothing could exceed the heartiness of the welcome extended to the battalion in all places through which it passed, and a favourable impression has been created amongst the civilian population, which should prove of great assistance to the regiment from a recruiting point of view. A few recruits were actually enlisted on the line of march, although the battalion is well over the establishment, and a fairly large and constant supply of recruits is usually forthcoming.

The March of the 1st Bn. The Welch Regiment through South Wales.

By Lieutenant D. A. N. LOMAX, 1st Bn. The Welch Regiment.

THE march of a battalion of infantry through its recruiting district must be of interest to all who study the modern territorial system. It is possible that such a march may clear away certain prejudices which exist against short service, especially when a march has been attended with complete success, as in the present instance. From the march of the 1st Welch Regiment there is something to learn. When its summary has been thoroughly digested, I venture to think that many sceptics will be considerably impressed with the capabilities of the young soldier, and their allegiance to the old system will, perhaps, slightly waver. We have in this case a battalion[1] of home soldiers, of whom 340 were under one year's service, and 230 over one year, and under two, the average age 20½ years; their experience of camping was nil, their habits and routine were learnt entirely at the depôt, and in the huts of Pembroke Dock, their physique was not completely developed, their ideas of soldiering had been but roughly formed. In short, they were very young, but willing, soldiers.

It would be useless to imagine that the march was carried out on Service conditions. The hospitality of the inhabitants made this an impossibility. From the moment the regiment left Pembroke Dock to the day of its departure from Cardiff to Plymouth, the inhabitants of the various towns passed through vied with each other in endeavours to entertain their territorial regiment. Had the battalion been returning from a victorious campaign it could not have been more magnificently received. The novelty of the Queen's uniform in some of the places visited was remarkable. At one village a regiment had never been seen; at another, the last troops seen were the troops of the Commonwealth; at another, a battery of artillery passing through some forty years ago was the sole military reminiscence the villagers possessed. This being so, it is not a matter of wonder that when their own territorial regiment showed themselves among their own kith and kin hospitality everywhere prevailed. Consequently we cannot but admit that the march was not made on Service conditions. But allowing for the extra encouragement which the continual hospitality fostered, there is no gainsaying the fact that the young soldier proved himself far more capable than he is usually supposed to be.

With the exception of the marches specified, marching order was worn. The following articles were carried in the valise:—1 flannel shirt, 1 cap, 1 set brushes, 1 cape, holdall complete, 1 pair socks, 1 towel, 1 pair of laces, 1 pair canvas shoes, 1 housewife; in the mess tin, 1 tin of blacking, 1 pot of blanco, 1 tin of dubbing; in the kit bags, which were carried on the company's wagons, 1 pair of boots with laces, 1 pair socks, 1 pair best trousers, 1 kersey, 1 tunic, 1 pocket ledger, 1 best serge. It will be seen that the kit bag contained articles which the soldier wore for walking out in town, church parades, etc., so that he might appear in the streets in a clean and smart manner. The above distribution answered in a most satisfactory manner; the kit bags were only taken off on Sundays and other gala days. With respect to the equipment, I hope I may be pardoned when I urge the necessity of distributing more perfectly the weight of the men's burdens. I say burdens, because there can be little doubt that the rolled great coat and mess tin weigh far too heavily on the very portion of a

[1] The total strength of the battalion on the march was 549. A company on detachment at Newport, and details left at Pembroke Dock, are included in the numbers given above representing age and service.

man's body which should be free from weight. Many of the men whom I asked said that they scarcely felt the weight of the valise; but all cavilled at the great coat and mess tin. It is too low down on the men's backs, and as evidence of this fact witness the attitude of the men at the end of a march, when all of them "stoop," for the simple reason that they are trying to get the rolled coat and mess tin higher on their backs. Two remedies suggest themselves: either let the great coat be carried above the valise, or worn *en banderole*.

Every attention had been paid to the men's feet and boots. The battalion had, prior to the march, undergone considerable practice in route marching; the boots carefully dubbed, had all been repaired, and the greatest trouble taken with their fit. On the march the men's feet were most carefully attended to; half-an-hour after the dinner hour each company paraded, barefooted and with trousers rolled up to the knees, and their feet carefully examined by the captain of the company. The most trivial case of chafe or blister was immediately treated. Hence only two cases of *bad* sore feet. The black leather legging might be improved. Fully 25 per cent. of the total of minor (as distinguished from bad) cases were caused by the legging. It is naturally a hard article to fit, and one wonders whether the puttee would not be worth a trial.

The early morning routine in camp was as follows:—

Rouse, 4.45 a.m.; Reveille, 5 a.m.; Breakfasts, 6 a.m.; Camp struck, 6.30 a.m.; Fall in, 7 a.m. The remainder of the day's arrangements depended entirely on the length and character of the march. The men's breakfasts were always of a very excellent description, and their haversacks on marching off contained bread and cheese, or, as a substitute, cooked rations, tinned beef, etc. The rate of marching was approximately 2½ to 2¾ miles an hour. Without packs the regiment marched from Margam Park to Porthcawl (7¾ miles), in under 2 hours. As a rule, the roads were good; in some cases very hilly. The weather from the moment we left Llandilo to the day we arrived at Pontypridd was very bad. The men pitched wet tents on wet grounds, and struck them under the same conditions. Their equipment and clothing were absolutely saturated, they had no chance of drying them, and they marched each day in the same wet-through clothes they had worn on the previous day.[1] It is no exaggeration to say wet through, for in many instances the men were wet to the skin one hour after starting. Their packs and clothes consequently became heavier, their comfort lessened, and their work increased fourfold, and consequently it may be justly urged, that the good treatment the men received on the line of march was balanced, if not overbalanced, by the meteorological conditions to which they were subjected.

It speaks well, therefore, for the spirit of the men, and also for the energy and zeal of the special recruiting staff which accompanied the column, that only nine men were absent on the arrival of the regiment at Plymouth, and that 113 men were enlisted; there were in addition 27 men who were refused on medical grounds, and very many more whom Captain King Hunter, South Wales Borderers, the recruiting officer, would not look at. No pains were spared in advertising, and pamphlets showing the advantages of the Army and the history of the regiment were scattered in the most profuse manner. Had there been shorter marches and more frequent halts, there would doubtless have been a great increase in the number of recruits.

There is one special point to which attention should be called—the bad weather caused great damage to the men's clothing. It is really not exaggerating the case to say that every man must have spoilt at least one serge and one pair of trousers, and also worn out one pair of boots, and in many cases other articles

[1] Each man on the march was allowed two blankets; there were eight mackintosh sheets per tent.

of his clothing as well. The first kit inspection at Plymouth thoroughly revealed this fact. Is it not a fair case for compensation? The men did their duty admirably on the march, and they were complimented on their good behaviour by the high constables and civic authorities of all the counties passed through; their patience under trying circumstances was excellent, and their general appearance was undoubtedly a great factor in the recruiting success. It will cost each man on the average well over £1 to replace the damaged clothing and necessaries. Surely a special case might be made.

The three days spent by the regiment at Cardiff will long be remembered by all ranks of the old 41st. The generous entertainments by the Mayor and inhabitants were responded to by the regiment in the gift to the Cathedral of Llandaff of the old Crimean colours of the 41st Regiment. The occasion was one of much ceremony, and the weather was beautiful. The battalion marched through Cardiff on the 16th, was welcomed by the Mayor and Corporation, and then trooped the old colours in the Sophia Gardens. It then marched to Llandaff, and the colours were deposited in that venerable cathedral. It is a significant fact that all the old surviving officers and non-commissioned officers and men who had fought in the Crimea under these colours, came from all parts of the United Kingdom to see them once more. Two officers unable to come through illness, and a few of the non-commissioned officers and men, too infirm to be moved, being the sole absentees. There were present: General Rowlands, *V.C.*, *C.B.*, and Major-General Allan (who bore the colours to their last resting place), Colonel Steward, Colonel Lowry, Major Bligh, Captain Edward Lowry, and twelve non-commissioned officers and men, all of whom fought in the Crimea with the 41st Welch Regiment. The colours were placed above a magnificent tablet erected by past and present officers, non-commissioned officers, and men; they now hang in close proximity to the old colours carried by the 41st in the American War of 1812. With these two old sets will soon be placed another, which—dare I say, less fortunate than its neighbours—has witnessed no scenes of war.

It must be gratifying to all to know that by charging a small fee for admission to the "Trooping of the Colours" and to a "German Tattoo" on the night of the 17th, no less than £380 nett was handed over to the Mayor of Cardiff for the benefit of local charities. With a generosity, which throughout marked his actions, the Mayor insisted that the greater portion should be sent to the secretary of the Local Veterans' Fund, for the purpose of relieving any very urgent cases of destitution or want. May it be hoped there will be no such cases, but should they arise, we shall be thankful to know that our visit was the means of effecting help to those whom it is a nation's duty to protect.

		ROUTE.			
July	27.—From	Pembroke Dock	to Tenby	11½ miles	
,,	28.—	In Camp	at Tenby	—	
,,	29.— ,,	Tenby	to Narberth	10½ miles	
,,	30.— ,,	Narberth	,, St. Clear's	12 ,,	
,,	31.— ,,	St. Clear's	,, Carmarthen	9 ,,	
Aug.	1.— ,,	Carmarthen	,, Llandilo	17 ,,	
,,	2.— ,,	Llandilo	,, Llanelly	19 ,,	Marching order not worn
,,	3.— ,,	Llanelly	,, Swansea	12½ ,,	
,,	4.—	In Camp	at Swansea	—	
,,	5.— ,,	Swansea	to Neath	9 miles	
,,	6.— ,,	Neath	,, Porthcawl	17 ,,	
,,	7.—	In Camp	at Porthcawl	Manœuvres	
,,	8.—	In Camp	at Porthcawl	Manœuvres	
,,	9.— ,,	Porthcawl	to Ewenny	9 miles	
,,	10.— ,,	Ewenny	,, Llanharran	10 ,,	
,,	11.—	In Camp	at Llanharran	—	

Aug. 12.—	From Llanharran		to Mountain Ash	17	miles	Marching order not worn
,, 13.—	,,	Mountain Ash	,, Merthyr Tydvil	11	,,	
,, 14.—	,,	Merthyr Tydvil	,, Pontypridd	14	,,	
,, 15.—	,,	Pontypridd	,, Cardiff	12	,	
,, 16.—		In Camp	at Cardiff			
,, 17.—		In Camp	,, Cardiff			
,, 18.—		In Camp	,, Cardiff			
,, 19.—	,,	Cardiff	to Plymouth			

190½ miles.

Average march –12⅔ miles *per diem*.

AUTUMN MANŒUVRES.

FRANCE.—The following interesting letter is reprinted from the *Morning Post* by kind permission :—

"Although the French soldier probably considers his lack of money deplorable, to his officers and to the medical authorities his inability to purchase drink and tobacco is most satisfactory. He lies down at night without having exceeded in either, and consequently gets up fresh for his march next morning. Moreover, if he does drink, he consumes but little alcohol in the *vin-du-pays*. He invariably has his coffee and some bread before starting—the hour of moving off in these days of almost tropical heat being at daybreak. These considerations are justified by the results, for undoubtedly nothing but praise can be awarded to the infantry. The absolutely cloudless sky, the burning sun, the dusty roads, the hilly country, and heavy kits all tend to severely try the men. It is noticeable that, possibly on account of the heat, not only are there intervals of about 10 yards between companies, but even in some regiments between sections. This gives breathing space, but adds to the length of the columns unduly, a serious matter when dealing with such large forces as an Army Corps. The pace of marching sustained, however, is considerable. The heat is still extraordinary, and one burning, breathless day is succeeded by another. The inhabitants of the neighbourhood declare it to be without precedent. The temperature in the shade under the roof of a railway station before mid-day on September 7th was about 110 degs. Fahr. Undoubtedly a large number of cases of illness from the heat have already occurred, although every possible precaution to guard against this is taken—open collars, and the back of the head and neck protected, etc. The cavalry and artillery have had considerably less casualties. Opinion collected from individual soldiers is very divided as to the respective merits of socks and of bandages. Some, supported by good Algerian experiences, own that with a well-greased boot and a well-greased foot neither are necessary. One of the most unpleasant features of this great heat is the great scarcity of water. This district of the Vosges, which contains the scene of the manœuvres, is at all times wanting in a good supply. It can be readily understood that the drought has there led to serious inconvenience. At Chalindrey, a railway centre of considerable importance, the large reservoir, constructed some few years ago by order of the Ministry of War, has been emptied. The waste of water in many cases is prohibited, and streams where they exist, have been dammed to form small reservoirs. To pour five Army Corps into such a district adds considerably to the difficulties of supply. Moreover, villages are not spared in the numbers of men and horses they have to accommodate. At Fayl-Billot, for instance, where the inhabitants are shown as but 3,000 in number, there have been billetted 1,200 men and 1,400 horses.

"The Army Corps additional to the 6th, 6th *bis*, 7th, and 8th, is made up

provisionally, and represents the skeleton force with which General Giovanninelli is entrusted the difficult task of fighting the remaining Army Corps commanded by General Saussier. With this skeleton force are to be found the independent division of cavalry already mentioned. It is worthy of note that this body of cavalry alone have the front rank armed with lances. The cavalry in no other case carry lances. The smallness of the squadrons, nominally 125 sabres, but actually less, as mentioned in the last letter, is due greatly to the absence from manœuvres of all horses under six years of age. Of course there are no reservists with the cavalry. The regiments of the Northern Force generally, if requiring more than four days' marching to get to Neufchâteau, were entrained. In spite of the military railway organisation, some of these fared badly. The 132nd Infantry entrained at Rheims for a journey averaging but three hours. It was performed, however, in not less than fifteen hours, and succeeded by a march of eight miles in the heat of the day. The men were utterly exhausted when they arrived at their billets. Regiments coming through Domrémy were marched past the house where Joan of Arc was born, and military honours were accorded to the house, which was afterwards visited by the troops, and explanatory addresses made by the officers. The concentration of the Northern Army was completed around Neufchâteau upon the 6th inst., and the 7th was a day of rest. Upon visiting the villages, which extended for some twenty miles to the south, in which the force lay, it was interesting to find troops engaged in assisting the removal of the crops. The country has, however, in accordance with General Saussier's letter to the local authorities, been well cleared, and little danger can be done.

"The general plan of operations may now be described. The Northern Army, under General Jamont (white head-dress), represents an invader, who, after forcing a passage through the Vosges mountains, crosses the Meuse and Moselle rivers, and directs his advance upon the fortified plateau of Langres. This plateau may be termed the key to the valleys of the Marne and Saône. The whole district of the Faucilles hills is commanded by Langres, and furnishes a most valuable line of defence against such an invasion. The army of the invader has consequently more marching than General de Négrier's Southern Force, which concentrated around Langres. Upon Sunday, September 8th, before the 7th and 8th corps completed their concentration, and whilst the Northern Force continued its advance, these two Army Corps manœuvred against each other as described lower down. The night of the 8th found the Northern cavalry as far south as Merrey, and a cavalry action is probable between the two armies upon Monday, 9th. Upon the 8th, with this action in view, the whole of the cavalry, with the 6th and 6th *bis* Corps, was formed into an independent cavalry division, but will be under the respective Army Corps commander again for the decisive battle of Tuesday, 10th. This will probably take place on the line Montigny-Parnot.

"After the battle, General Saussier assumes command of the combined armies and fights north-east against the skeleton force in the direction of Mirecourt. It is safe to assume that both the Northern Army and the skeleton force will be in turn defeated. They both represent an enemy coming from the east. Upon the 18th of September the troops rest, and finally upon the 19th of September the grand review of the five Army Corps takes place at Mirecourt. By those interested in the possibilities of an invasion such as the scheme provides, reference should be made to an extract from 'La Guerre de Demain.' This book, written by a professor at St. Cyr, is of a like nature to the 'Battle of Dorking,' and the extract is termed 'La Bataille de Neufchâteau.' As mentioned above, the 7th and 8th Army Corps were engaged upon Sunday, the 8th, in the neighbourhood of Fayl-Billot. The special idea of operations was that the 7th Corps stationed along the line of the Mance should deliver an attack upon the 8th Army Corps who held the railway about Andilly.

The river happens to be dry. The 8th Corps repelled the attack. In consequence of the heat the troops got into position all through the night, commencing at about 10·30 p.m. on the 7th. The fight was over before seven in the morning, the combined Corps then moving north to await the attack of the Northern Force.

"This battle and one of the former divisional engagements bring to notice some striking points—notably the total abolition of regimental supports and reserves. The argument is that modern fire damages reserves and supports to such an extent that it is better to have them in the firing line. Certain regiments, as time and occasion may permit, are told off for and constitute the reserve. They are kept some 500 yards in rear, but the remaining regiments throw every man into the firing line. There they stand—no other position was ever to be observed. It is stated that other positions are not forbidden; they are certainly not encouraged. Undoubtedly, when men get down it is hard to get them forward again, and with no regimental reserves to carry them forward the difficulty is probably increased. The use of *éclaireurs* still exists, though probably to be discontinued. As ground scouts, as they would be termed in the cavalry, they are too numerous, as fighters they are too few. Sometimes they covered the whole front of the battalion, at other times the central companies only."

FOREIGN PERIODICALS.

NAVAL.

AUSTRIA-HUNGARY.—*Miltheilungen aus dem Gebiete des Seewesens.* No. 9. Pola and Vienna: September, 1895.—"The Cruiser Division" (with fine instantaneous photograph of the squadron at steam tactics when reviewed by the Emperor). "Telegraphy without long-distance wires." "Night recognition Signals for Torpedo-boats." "English Fuses." "Mumford's Water-tube Boilers." "The French Naval Budget for 1896." "The Danish cruiser 'Hekla'" (with photograph). "Foreign Naval Notes." "Experiments with Auto-mobile Torpedoes at Newport, U.S.A." "A new water-excluding substance for Coffer-dams." "A Modern Naval Battle." "An Electric Motor for Boats." "Book Notices."

DENMARK.—*Tidskrift for Söväesen.* No. 4. Copenhagen: 1895.—"Napoleon's contemplated descent on England, 1803-5." "On Engine and Boiler-room Explosions in Ships."

FRANCE.—*Revue Maritime et Coloniale.* Paris: July, 1895.—"A Study as to the method of ridding a ship of water from leaks, with special reference to the battle-ship 'Marceau'" (with plans). "A Study on the Navigability of the Red River" (Tonquin). "The Mechanical Theory of Heat" (*concluded*). "Maladies of Seamen and Naval Epidemics." "Foreign Naval Chronicle." "The German Naval Budget for 1895-6." "The Naval Academy at Leghorn." "The Sea Fisheries." "Notices of Books."

Le Yacht. Paris: 3rd August, 1895.—"The Naval Manœuvres and the Mobilisation" (E. Weyl). "Yachting News in France and the English Regattas." "Naval Notes, Home and Foreign." "The Naval Manœuvres in the Atlantic." "Proposed Signals for indicating course in fogs or at night." "Notices of Books." 10th August.—"The Exploitation of the Maritime Fisheries, Professional and Technical." "Yachting Notes" (photographs of regattas). "The American yacht 'Defender'" (with photograph.) "The Naval Manœuvres in the Channel" (*concluded*). "Naval Notes, Home and Foreign." 17th August.—"How I took part at the forcing of the entrances to Cherbourg." "Yachting News" (with photographs). "Launch of the battle-ship "Massena" (with photograph of the ship on the ways). "Naval Notes, Home and Foreign." "The English Regattas" (with photographs). The Steering Apparatus of the 'Defender.'" "Book Notices." 24th August.—"How I took part at the forcing of the entrances to Cherbourg" (*concluded.*) "Yachting News" (with photographs.) "Naval Notes, Home and Foreign." "Trial of Armour-plates at Creusot for the Swedish Navy" (with photographs). 31st August.—"Modern Naval Tactics: Opinions of the English Press." "Yachting Notes" (with photographs.) "Naval Notes, Home and Foreign." "The loss of the 'Dom Pedro,' Decision of the Court."

Le Moniteur de la Flotte. Paris: 3rd August, 1895.—"Speed and Coal Endurance" (Marc Landry). "The Naval Manœuvres." "Colonial Notes." "Naval Chronicle, Home and Foreign." 10th August.—"Some more remarks on Speed and Coal Endurance" (Marc Landry). "The Commission on the

Classification of Officers." "The English Naval Manœuvres." "Notes from Madagascar." "Naval Chronicle, Home and Foreign." 17th August.—"The Naval Manœuvres" (Marc Landry). "The President of the Republic at Fécamp and Dieppe." "Notes from Madagascar." "Rear-Admiral Lejeune, Obituary Notice." "The English Naval Manœuvres." "Naval Chronicle, Home and Foreign." 24th August.—"On Water-tube Boilers" (Marc Landry). "The Squadron of the North at Havre." "Notes from Madagascar and the Colonies." "The English Naval Manœuvres." "Naval Chronicle, Home and Foreign." 31st August.—"The Japanese Naval Victories" (Marc Landry). "Delays in the supply of material for new ships under construction." "Notes from Madagascar and the Colonies." "Naval Chronicle, Home and Foreign."

La Marine Française. Paris: 10th August, 1895.—"The Naval Manœuvres in the Mediterranean." "Torpedo-boats and Liquid Fuel." "The Japanese at Weï-haï-Weï." "A Technical Bureau for Naval Construction." "Foreign Naval Chronicle." "Mercantile Marine Chronicle, Home and Foreign." 25th August.—"The Minister of Marine." "The Japanese in China." "On recent Discussions on the Rolling of Ships." "Speed and Coal Endurance." "A Technical Bureau for Naval Construction." "Foreign Naval Chronicle." "Mercantile Marine Chronicle, Home and Foreign."

GERMANY.—*Marine Rundschau.* Berlin: September, 1895.—"The Necessity for a regular system of Athletic Training for Naval Officers, and some proposals for carrying it out." "The History of Wilhelmshaven" (with two sketches). "Report of the Commander of the 'Iltis' to the Minister of Marine on the events at Tamsui" (with sketch). "Some remarks on measuring distances at sea." "On the question of the Supply of Fresh Water to Boilers." "The new second class cruisers 'K' and 'L.'" "Foreign Naval Notes."

RUSSIA.—*Morskoi Sbornik.* St. Petersburg: July, 1895.—"On Smokeless Powder." "Ship-building in England and France, 1894-95." "New Problems in Oceanography."

SPAIN.—*Revista General de Marina.* Madrid, August, 1895.—"The Naval Architects in Paris." "Elementary Electro-Dynamics." "Observations of Precision with the Sextant." "The cruiser 'Isla de Cuba,' a Study on the magnetic conditions with reference to the situation of the Thomson's Compass." "Book Notices."

MILITARY.

AMERICA.—*Journal of the United States Artillery.* July.—"Experiments with a new Polarising Photo-Chronograph, applied to the measurement of the velocities of projectiles," by Dr. A. C. Crehore and George O. Squier, Lieutenant 3rd Artillery. "The Development of a Naval Militia," by J. W. Miller, Commander Naval Battalion, New York. "Extracts from the Journal of Lieutenant J. Wilkinson, 6th Artillery, serving with 'Light Battery "H"' of that regiment at Fort Riley, Kansas"; very interesting, the ground available for manœuvre and shooting is 21,000 acres. "A proposed modification of the Field-Gun Sight," by E. E. Gayle, Lieutenant 2nd Artillery. "Light Artillery Target Practice," by E. Hinds, Lieutenant 4th Artillery. Special attention is called to the excellence of the "Professional Notes."

AUSTRIA.—*Organ der Militair-wissenschaftlichen Vereine.* August.—"Modern weapons and their employment in the field." "Notes on patrolling deduced from experience in the Mountains of the Tyrol"; full of practical hints worth remembering. "General Dragomirow on the Psychology of Modern War"; a very remarkable article on the General's favourite theme. "It is not the gun, but the man that stands behind it"; in the notes on Napoleon's method of communicating his orders in certain cases, he suggests that the power of the Emperor's eye literally hypnotised his subjects.

AUSTRIA-HUNGARY.—*Mittheilungen über Gegenstände des Artillerie- und Geniewesens.* Nos. 8 and 9. Vienna:—"Summary of Recent Experiments with Artillery and Small Arms." "Ueber den Einfluss von Portée-Differenzen der Geschütze auf die Präcision des Einschieszens." "Ein Artillerie Schiesz-spiel Apparat." "Field and Provisional Bridging in India," translated from Major Aylmer's "Notes on Bridging."

FRANCE.—*Revue du Cercle Militaire.* Paris: 3rd August, 1895.—"Our Infantry Regulations and German criticisms," runs through the next four numbers; a careful article, worth study. "From Madagascar," a cheerful, soldierlike letter, in marked contrast to the pessimistic telegrams in the daily press. "The Passage of the Balkans," by General Gourko. 10th August.—"The Folding Bicycle in Garrison Manœuvres," this bicycle was described in Nos. 20 and 27 of this paper; the present article gives result of experiments, and is well worth the attention of cyclists. "The Madagascar Expedition," summary of operations from official sources (with map). 17th August.—"The Army Manœuvres, 1895," gives full *ordre de bataille* of the five corps engaged. "Madagascar" (*continued*). 24th August.—"The Legend of the Texel," demolishes the popular delusion that the 8th Hussars captured the Dutch Fleet in the ice—the fleet surrendered without a shot. "The British Militia." "Madagascar" (*continued*). 31st August.—"Cyclists as Auxiliaries to Cavalry;" worth reading. "The new Commander-in-Chief of the British Army," short summary of Lord Wolseley's opinions, sensibly and temperately compiled. "Instructions for the Manœuvres in the East." Saussier's orders.

Revue de Cavalerie. August.—"Rezonville"; detailed study of the cavalry movements in the battle of the 16th August (with maps). "Instruction and leading of Cavalry"; translated from the German of General von Pelet-Narbonne (*continued*). "The German Cavalry and the Army of Chalons" (*continued*). "The Trooper and his Horse"; practical suggestions for the training of both, worth reading. "Observations on the French Army, 1792-1808"; an exceedingly interesting study of the army and the conditions which evolved it. "The paces of the horse as revealed by the experimental method," by Lenoble du Teil; a very able and clear discussion of the principles of equitation, which it is to be hoped may shortly appear in book form.

L'Avenir Militaire. Paris: 2nd August, 1895.—"The 'Intendance' and the German Language," an amusing description of a German lesson in a French military school; applies equally to our own. "Three Years' Service in the Artillery." 6th August.—"Clouds on the Horizon," discusses the two Eastern Questions. "Classification of Artillery Horses." 9th August.—"The Transport Question in Madagascar," discusses the prospects of the narrow-gauge railway. "Forage Contracts in Algeria." "Too many Examinations." 13th August.—"The Dearth of Non-commissioned Officers." "Autumn Manœuvres." "Meat Contractors," exposes a disgraceful case at Romorantin. "Employment of Re-engaged Non-commissioned Officers." 16th August.—"Les Bataillons Scolaires," describes the rise and collapse of these school battalions. "Soldiers

Children and the Non-commissioned Officers' Question." "General Officers and the Age Limit." 20th August.—"Past and Future," *à propos* of the Sedan anniversary. "The Promotion Problem." "Non-commissioned Officers' Messes"; worth reading. "Military Contractors," further exposures, reminding one of New York, 1862-64." "The Battles of 1870, before Metz." 23rd August.—"The Manœuvres and War," discloses the first note of pessimism, as regards the Madagascar Campaign, this paper has yet published. "Algerian Contracts." "Small-bore Rifles in America." "The Sick in Madagascar"; read. 27th August.—"What ought to be done in Madagascar," the editor seems now to have quite lost his bearings and his nerve. "The Strategy of the Japanese," accuses the English captains of the Nippon-Yusen line of steamers of treachery, but adduces no evidence. "British Influence at Tananarivo," reprint of Mr. Knight's letter to the *Times*. Non-commissioned Officers' Messes." "The accident to the 'Brinkburn.'" 30th August.—"Strategic Dreamers," a clever article laughing at the strategists who foresee an English or German Invasion of the Cotentin Peninsula. "Quick-firers for Field Artillery," *à propos* of recent experiments at Chalons, suggests four guns per battery instead of six, since quick-firers can fire so much faster! "The Reserve Regiments in 1895," comments on the training of reserve officers.

Revue Militaire de l'Étranger. Paris: August, 1895.—"Portuguese Possessions in East Africa, and their colonial troops." "The Examinations for Promotion in England," translation of the papers set at the last examinations for lieutenants and captains. "The Chino-Japanese War" (*concluded*). "Experimental Firing at Captive Balloons," interesting *résumé* of experiments; balloons appear to have little to fear.

Revue d'Artillerie. Paris: August, 1895.—"The Grand Battery of the Imperial Guard at Wagram," very interesting study by Colonel E. Litre. "The Artillery at the commencement of the Revolutionary Wars," by Captain G. Rouquerot. "Graphique de convergence pour le tir indirect de côte."

Journal des Sciences Militaires. August.—"Combined Tactics of the Three Arms," by M. Chatterbox. "The Campaign of 1814," by M. Weil. "Frontiers and Fortresses of the principal Powers—Belgium." "The Engineers." "Turenne and the French Army in 1674." "General Alexis Dubois." "Notes on the Valley of Aosta."

Spectateur Militaire. 15th August.—"Organisation of Commands and their Staffs," by Noel Desmaysons. "La Lutte pour le Bouclier," by L. Brun, advocates portable shields for storming columns. "Medals: Decorations and Crosses," by C. Boisonnet. 1st September.—"The Legion of Honour." "Marshal Dode de la Brunerie," an episode of 1812. "La Lutte pour le Bouclier.' "Medals: Decorations and Crosses."

Revue du Genie. August.—"The German Pioneers in 1870." "The Operations on the Loire." "Effect of Austrian high-explosive shells on shelters, etc."; read. "Description of a Bridge over the Kabul River in 1880," from the Professional papers of the Corps of Royal Engineers.

Revue Militaire Suisse. 15th August.—"Military Re-organisation in Switzerland," by Colonel Lecomte, takes up the whole number; well worth reading.

GERMANY.—*Deutsche Heeres Zeitung.* 31st July.—"The leading of the Turkish Army in the Balkans," 1877-78"; a study by Thilo von Trotha (*concluded*). 3rd August.—"The Promotion of the French Captains," based on articles in *L'Avenir Militaire*; worth reading. "More about the new French Regulations for Field Service"; practical comments. 7th August.—"The Kaiser Wilhelm Canal and the Neutrality of Denmark." "Military Discipline, the key

point of the Socialist Question"; very interesting. The N.C.O.'s require to have their position strengthened, everything depends on their loyalty. 10th August.—"State Fortifications"; study of a new book, by Toilow. "Comments on: 1, The Employment of the Reserves in the Battle of Vionville-Mars-la-Tour, by Lieut.-General von Wodtke; 2, My Experiences in the Battle of Vionville-Mars-la-Tour, by Colonel von Schaumann, by Captain Hoenig; worth reading. "Infantry Tactics"; comments on Colonel Mignot's articles in the May number of the *Journal des Sciences Militaires*, advocating single rank line attacks. 17th August.—"The decisive fighting on the Saale, 1866." "The Fire Instructions for the Field Artillery"; continued throughout the month; a very thorough discussion of the points involved. 21st August.—"Chitral"; a colourless and inaccurate sketch of the recent campaign. 24th August.—"Strategic Ocean Canals"; discusses the Baltic and Black Sea, and the Atlantic-Mediterranean projects; is not enthusiastic about either. 28th August.—"Military Schools in France"; reviews the articles in *L'Avenir Militaire*, by General Cosseron de Villenoisy. 31st August.—"A Russian Criticism of our New Field Exercises"; discusses the degree of independence to be allowed to subordinate officers.

Militair-Wochenblatt. 3rd August.—"Proposed Reforms in Musketry Instruction." "Changes in the Military Articles of the Swiss Confederation.' 7th August.—"The Mobility of Field Artillery"; a practical article, dealing with purchase and training of remounts. "The Summer Drills of the Russian Army, 1895." "Officers' Schools in Austria"; interesting. 10th August.—"Memoir of General von Tresckow." "The Italian Army Estimates, 1895-96." "The Report on the Progress of Musketry Instruction in France, 1894." 14th August.—"Kriegslehren"; review of Scherff's recent work, by Major-General Keim." "French Navy Estimates, 1896." "Re-engagements in the Russian Army." 17th August.—"The 18th August." "Errors and Prejudices concerning the Action of the Curb"; a practical article. 21st August.—"The Veteran Societies." 24th August.—"The Colonial Forces of Germany." 28th August.—"Conditions for the New Cross-Country Riding Competitions"; worth study.

Supplement to the Militair-Wochenblatt. "The Italians in Africa," by von Bruchhausen, Captain a-D.

Jahrbücher für die deutsche Armée und Marine. September.—"Friedrich von Hellwig and his raids, 1792-1814"; a study of partisan operations, by Lieut.-Colonel Fabricius. "The Evolution and Training of the Bavarian Field Artillery up to 1874," by Major-General von Speck. "Fortress Manœuvres," by Lieut.-Colonel Frobenius. "A Soldier's Life in the Thirty Years' War," by Captain Baumann. "The Organisation of Military Cyclists." "A contribution to the History of the Local Defensive Forces in the towns of the Mark of Brandenburg in the Sixteenth Century," by Lieut.-Colonel Schnackenburg. "Summary of recent Military Inventions," by Major Schott. The section on French and Russian Q.-F.'s deserves reading.

NOTICES OF BOOKS.

Colonel Sir Robert Sandeman: His Life and Work on our Indian Frontier. By THOMAS HENRY THORNTON, C.S.I., D.C.L.

Nine out of every ten of the average educated and intelligent electors of Great Britain could tell one all that there is to know about Mr. John Burns, or Mr. Labouchere, and could probably give graphic details of the career of Mr. W. G. Grace; but to the same percentage the name of Sir Robert Sandeman would be practically unknown, and the vast country, whose destinies he ruled so well and so happily, would be scarce more than a mere geographical expression. It is unfortunately only too true that but little they know of England who only England know. As Rudyard Kipling puts it, we are too near and too well fed to realise that "the captains courageous of old have only changed their dress a little, and altered their employments to suit the world in which they move." Though we smoke cigarettes and only swear mildly, the race still produces "big men all and not very much afraid of responsibility," and when this fact is brought prominently under public notice he who does so merits the deep gratitude of those who love the Empire. This gratitude Mr. Thornton well merits for giving to us an excellent and graphic account of one of the best men that the Indian Empire has ever been served by, and, though laying it before us with the authority of one who has been Secretary to the Punjab Government and Foreign Secretary to the Government of India, doing so in a manner that in no way obscures the brilliant personality of the man whose life work he has so ably described. Sandeman takes rank amongst the best of the many good men by whom the Indian Empire has been served, and to say this of him is no small praise. Never yet has an Empire been able to show a grander roll of soldier statesmen than those comprised in "that band of resolute, vigorous, and patriotic men which has existed for a century and a half for the founding, the extending, and the consolidating of the British Empire in the East." For a detailed account of Sandeman's career we must refer our readers to Mr. Thornton's pages, but we can briefly refer to the great work on which the reputation of his life will stand, and by which the next century, looking back through a clearer light than we now can do, will be able to gauge and fully value the worth of the man. To him, above all men, we owe it that the Khanate of Khelat, or Biluchistan proper, and the independent Pathan territory lying between the Pishin and the Punjab has been converted from a conglomerate of turbulent tribes into an outwork of the Empire, which has loyally accepted British supremacy, and in so doing has not only insured our safety, but permanently secured to its peoples the blessings of peace and just government. Selected by Sir John Lawrence—than whom none knew better how to pick men—Sandeman was in 1859 appointed an Assistant Commissioner in the Punjab, though the political work of his life may be taken as having commenced in 1866, when he was placed in charge of the Dera Ghazi Khan district. Here he was at the southern end of the Trans-Indus Punjab, in close proximity to Sind, and on the immediate frontier of those tribes whose transformation into peaceable vassals of our great Empire was to be his future task. This task was no easy one. Wrong ideas of frontier policy had to be contended against, and varying opinions reconciled, and this Sandeman succeeded in to such an extent that in 1878, when the Afghan War broke out, the Murri and Bugti tribes were our allies; the Bolan was open, and our position at Quetta established; the unruly Sirdars of the Khan of Khelat had been reconciled to their suzerain, and were with him in close alliance with the British Government, and

we had only to march on Kandahar, through a friendly country with our army, having "all the resources and supplies of an united Khelat State, placed freely, and even enthusiastically, at its disposal." What Sandeman did in doing this, and what was the character of the chief with whom he had to deal, is sufficiently evinced by the fact that "a year and a half after Sir Robert's death the Khan was deposed for an act of savage barbarity, and is now a State prisoner." As Mr. Thornton says, it is not too much to assume that if Sandeman were now alive the Khan "would still be governing his dominions as the trusted ally of the British Government." This now deposed chieftain wrote to him in 1880:—"Anyone who knows aught of the past and present state of this land of Biluchistan can justly appreciate what has happened. The excellence of your management of affairs and your services are as clearly seen as the sun by the British Government, and by all people great and small. There is no need to dilate upon them particularly, but being deeply indebted to your valuable services I with heartfelt sincerity write these few words by way of thanks . . . . May God protect you." He received this on the eve of his departure for a well-earned leave, many months of the twenty-one, over which it extended, being spent in "pressing upon the authorities the paramount importance of retaining the territory under British administration, and completing the railway (already partially constructed) through the Harnai Valley to Pishin." On his return, his life's work was to be completed "by bringing under British control and influence the independent Pathan tribes between British Biluchistan and the Punjab." Not only would the occupation of the Zhob Valley ensure us an easy access to the Pishin from the Punjab, but the reduction to order of the tribes in this area would put an end to continuous disturbances on the frontier, and open up to traffic and trade the Gumal Pass, a work of urgency, inasmuch as on it the two most important caravan routes converge; that from Chazni, Kabul, and North and East Afghanistan, and that from Kandahar and West Afghanistan. The success with which this work was achieved by Sandeman may be best described in the words of the *Pioneer*. "It practically amounts to this, that by a masterly piece of strategy a position almost impossible to attack in front has been turned and occupied, though held in great force by some of the most turbulent border clans we have had to deal with, without the loss of a man . . . . In the whole scheme of frontier defence no measure can rank with the occupation of the Zhob Valley and the passes inward for completeness and effectiveness. And the way in which it has been brought about may be regarded as in all respects a model of border administration. Sir Robert Sandeman throughout his meritorious career of service to the State has never done a better piece of service than this." Sandeman's work in the Zhob Valley and adjacent territory being completed, his attention was next turned to Western Biluchistan, and in improving and consolidating the administration of those territories the short period of life that remained to him was to be spent. A journey to Panjgur in this connection was followed by a short spell of leave home, and on his return he made his last journey to Lus Beyla where, to quote his own words, "I meet the Kej-Mekran and Panjgur chiefs, and settle with them about the protection of the trade route and the collection of revenue and other matters of importance."

Here he died after an illness of but ten days, and in a shady grove near by where the Parali River runs down from the Jhalawan hills lie the mortal remains of one whose career has shed an additional lustre on the already glorious records of Indian administration. Over his tomb the Jam of Lus Beyla has erected a dome, but his real monument, which will endure through all ages, is in Biluchistan itself. "*Si monumentum quæris circumspice*," as says a writer in *Pioneer*. He who pens these lines once had the privilege of serving under his orders, and it is to him a very real pleasure to be able to add his humble testimony to Sir Robert Sandeman's worth as a just, upright, and kind official, a fearless soldier, and a clean-hearted, God-fearing English gentleman.—H. L. S.

Report of the Operations of the Division of Military Engineering of the International Congress of Engineers, etc. Washington, 1894. Printed for Congress.

In connection with the Chicago Exhibition of 1893 arrangements were made for a series of congresses "to present to the people of the world the most important results attained in the several departments of civilised life, voiced by the ablest living representatives whose attendance (in person, or by paper) can be procured." One of the results, now before us, is a volume of nearly 1,000 pages, consisting of forty-two separate papers on branches of military engineering, on weapons, on supply and transport, and on sanitary service. About half of them are by officers of the U.S. Army; but British, French, German, Swiss, Swedish, and Mexican officers are among the contributors.

The British experts have been well chosen. Sir G. Clarke and Colonel Lewis write on coast defence, Captain Maude on field fortifications and intrenched camps, Major Bate on military railways, and Colonel Beresford on the collection and transmission of intelligence in the field. There is a very elaborate paper (110 pages) by Captain Moch, of the French Artillery, giving a general review of existing artillery, and discussing the probable directions of advance; and there are several papers on gun construction, including one by Mr. Longridge.

Lieut. D'Armit, of the U.S. Engineers, describes the evolution of intrenched camps in a careful paper (30 pages) and sets forth the claims of General St. Clair Morton (killed at Petersburg in 1864) to be regarded as a pioneer of progress. This is followed by Captain Maude's paper (50 pages), which deals with the same subject in a more original and controversial way. Starting with Sir G. Clarke's paradox, that the better the works the worse the defence, he shows how this is to be accounted for, so far as it is historically well founded. More humane sentiments, improved roads, and better drill combined to lessen the reputation of the old fortresses before modern improvements in weapons. The fame won by improvised defences of late years is largely due to special conditions (and preparation of the attack, etc.) which cannot be counted on in future. A digression, interesting but rather disproportionate, is made to the battlefields of Mars la Tour and Gravelotte, to show that the influence of breechloader fire is overrated. He concludes that hasty field works are no efficient substitute for permanent works with deep ditches. At the same time the latter will be usually put out of the question by the development and cost now entailed, for even 20,000 yards is now (he thinks) too little for the radius of the circle efforts. On this, as on several other points, there is room for difference of opinion; but the paper is forcible and suggestive.

Sir G. Clarke's paper, short as it is (14 pages), is full of matter. It is compressed without loss of clearness, and is marked not only by his usual merits of style, but by a tone more than usually judicial. He deals with the general policy of coast defence, only glancing at technical details; and especially considers the case of the United States, where the Board on Fortifications of 1885 have gone far beyond even Lord Palmerston. But on this point General Abbott's paper (14 pages) should also be read.

It is a pity that the book is disfigured by frequent, and sometimes grotesque, misprints.

This work is not on sale, but the Committee of the Engineering Congress has been able to collect a small number of this Report, for the especial benefit of the military engineers in England and the Continent, who may desire to obtain a copy. Officers wishing to obtain a copy may do so (until the supply is exhausted) by sending an order to the Publisher of *Engineering*, 35, Bedford Street, Strand, to whom has been entrusted, by the Committee, the distribution of the work, the order to be accompanied by a remittance of 3s. 2d., or the book can be obtained for 2s. 6d. by personal application to same address; the above price merely covers the cost of publication.

In the Track of the Russian Famine: The Personal Narrative of a Journey through the Famine Districts of Russia. By E. A. BRAYLEY HODGETTS. London: T. Fisher Unwin, 1892. Price, 3s. 6d.

Through Famine-stricken Russia. By W. BARNES STEVENI, special correspondent of the *Daily Chronicle*. London: Sampson, Low, Marston and Co., 1892. Price, 3s. 6d.

These two works seem to have escaped the attention they very richly deserve, particularly from those whose business it is to form for themselves a correct appreciation of the fighting strength of our Northern neighbour. The armed force of a nation may be aptly compared to the machinery and gearing of a steam-ship, perfect in design and proportion for the work expected of it, but useless unless the available fuel will get up a sufficient head of steam to overcome the internal resistance. In the case of Russia it is these internal resistances which have been too generally overlooked, and more particularly the causes which have led to their development. Briefly, these may primarily be traced to the emancipation of the serfs before these latter were in a condition of intellectual development adequate to accept their new responsibilities.

The village *mirs*, possessing property on the socialistic principles, first converted their property into money, and then the money into drink, and the nation is now reaping the harvest in the shape of famine and subsequent pestilence. Moreover the process is continuing in a geometric progression. As each acre of forest falls before the axe of the woodcutter, the chances of rain in a bad year are decreased, each period of scarcity resulting from a bad year entails the further destruction of the draught animals, and in the absence of draught cattle ploughing for the next season's crops becomes an impossibility. Year by year the evil is thus intensifying, and whole tracks in the richest portion of the black earth region are passing out of cultivation and turning into wastes of moving sand, springs are disappearing and the rivers are shrinking to mere rivulets. Given capital and efficient supervision, doubtless irrigation may be as profitably employed as it has been in India; and given sufficient time, the process of education all ranks of society are now receiving in passing through the mill of universal service, may lead to the evolution of those qualities in individuals which alone attract and conserve capital. Herein lies Russia's best hope of salvation. But if her rulers enter with a light heart into schemes of aggression, in the hope of thereby securing an outlet for popular discontent, the clock of progress will be put back by another half century, and for years to come Russia will remain but a geographical expression.

History of the Campaign of General T. J. (Stonewall) Jackson in the Shenandoah Valley of Virginia, from November 4th, 1861, to June 17th, 1862. By WILLIAM ALLAN, formerly Lieut.-Colonel and Chief Ordnance Officer, Second Corps, A.N.V., with full maps and plans. Philadelphia: Lippincott and Co.; and London: Stanford, 1880.

Few books on the American War with which we are acquainted give a better idea of the tremendous difficulties the leaders of those days had to contend with, arising from the qualities of the raw material placed at their command. As year by year the difficulties in the way of the maintenance of discipline in peace time in our own army are aggravated by the attitude of the public and the indiscreet interference of the press, the need of this personal qualification for command grows in importance, and the value of examples of what can be done even with the most difficult material increases. There are many of us still who at times repine over the good old days, when the hold of the officer over his men was like that of the centurion in the Bible, "Go, and he goeth . . . come, and he cometh"; but in view of the extraordinary fighting power these American levies ultimately developed—a power perhaps never exceeded by any troops in the

world—it would certainly seem as if the discipline evolved by experience, and the personal aptitude for command, of which "Stonewall" Jackson was so brilliant an example, will in the end prove a safer foundation to trust to than the old machine-made product of sixty years ago.

The Physical Geology and Geography of Great Britain. By the late Sir ANDREW C. RAMSAY, LL.D., F.R.S., etc. London: Stanford, 1884.

This book is most strongly recommended to all officers who wish to acquire the power of rapidly reconnoitring and sketching large areas of ground, and even those content only to read and understand a map will find it of immense assistance. It is not that they will find in it rules and prescriptions to be applied by scale to each problem as it arises, but it is exceptionally calculated by its style to awake in the reader the habit of observation and enquiry, which only needs exercise to develop in the most surprising degree. Field geology, in proportion as it is more or less understood, supplies a check on the memory, a check on imagination, and a check on the small scale map, and with the aid these three checks supply a man can deal with a tactical or strategic problem on unknown ground, with a certainty and confidence no other knowledge can give him; but to attain this degree of confidence is a matter of observation and thinking, which no cramming will supply, and no better work to induce this habit of mind is as yet accessible.

History of the 2nd Argyll and Sutherland Highlanders. By LIEUT.-COLONEL PERCY GROVES, Royal Guernsey Artillery. London and Edinburgh: W. and A. K. Johnston, 1895.

Presuming that this publication is intended for one of a series of popular histories of Scottish regiments, it may be said to well answer the purpose. The book is cheap. The matter is condensed, and yet includes the prominent events which have distinguished the career of the old 93rd Sunderland Highlanders. The record is, perhaps, unusually brief, containing only thirty-three pages of large type, and cannot, therefore, be called a history. But no history is called for, seeing that the 93rd have had their praises sung on many an occasion, and as late as 1883 had their history fully written by Captain R. H. Burgoyne.

The book is illustrated in the peculiar style of Mr. H. Payne. The figures are too crowded, and the wealth of colour is so exaggerated as to give a decidedly bizarre effect to the pictures.

Alexander des Groszen Feldzüge in Turkestan. Commentary on the histories of Flavius Arrianus and Curtius Rufus. By FRANZ VON SCHWARTZ. Munich: Dr. E. Wolff. Price, 6s.

The author of this work spent fifteen years in Turkestan, and made himself thoroughly acquainted with all Alexander's routes and marches. With reference to recent Græco-Bactrian discoveries in Chitral and that neighbourhood, this work should prove of considerable interest to specialists. It is very favourably reviewed by the *Militair-Wochenblatt.*

Taktische Eigenthümlichkeiten der Russischen Armée. By MAX CSICSERICS VON BACSÁNY, Captain in the Austro-Hungarian General Staff. Vienna: Kreisel und Gröger, 1895.

This work is strongly recommended both in the German and Austrian press to all students of the Russian Army.

Leçons d'Artillerie, conformes au Programme de l'École Militaire de l'Artillerie et du Génie de Versailles. By CAPTAIN E. GIRARDIN, of the French Artillery, Professor at the Artillery and Engineer School of Versailles (with illustrations, etc.). Paris: Berger-Levrault, 1895. Price, 7·50 francs.

The chief points touched on in this work are the properties of gunpowder and explosives, theoretical and practical ballistics, the effect of projectiles, aiming, and regulation of fire. The book is very warmly recommended by the *Militair-Wochenblatt.*

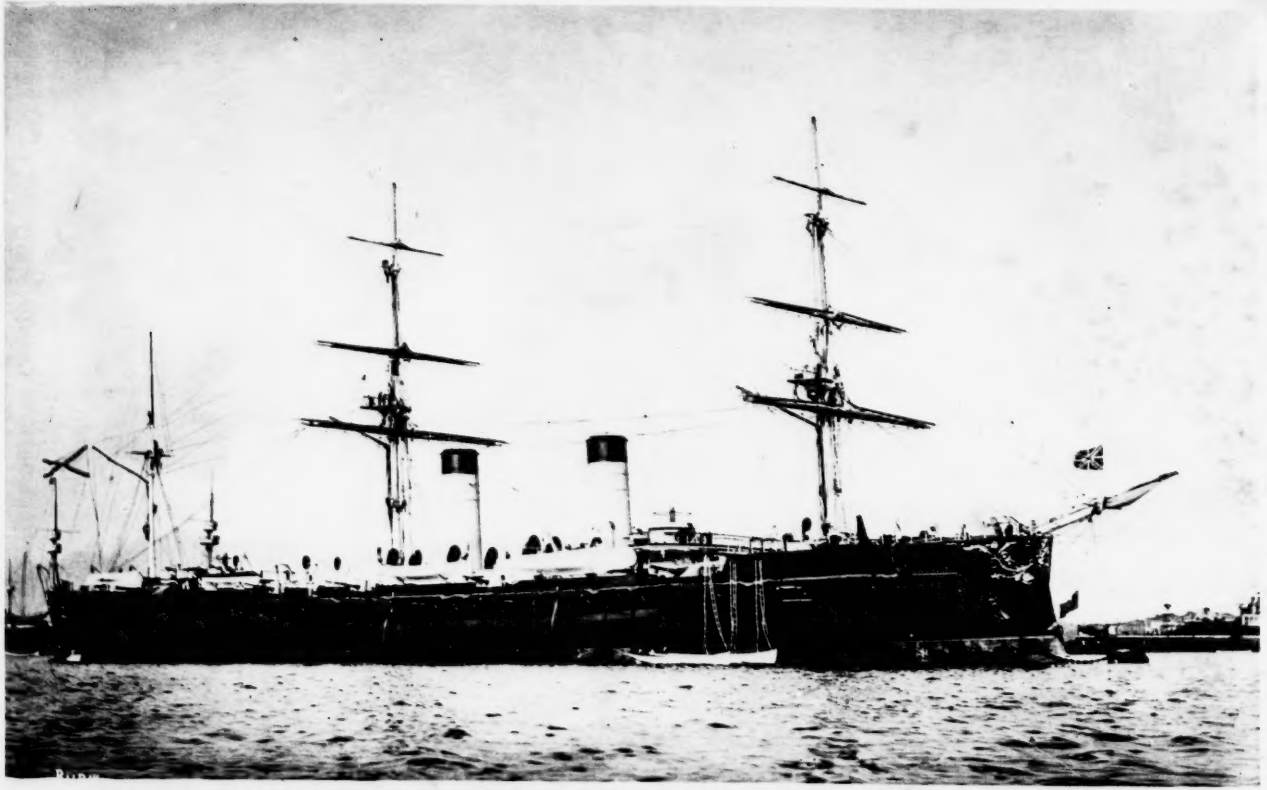
Ungarns Pferdezucht in Wort und Bild. By GRAF C. G. WRANGEL. Stuttgart: Schickhardt und Ebner. Price, £3 4s. 6d.

This work is now complete in 28 parts, and has been very favourably reviewed both in Germany and Austria.

Les Manœuvres de Forteresse: Souvenirs de Vaujours. By M. HENRI MAZEREAU and M. EDOUARD NOEL (with maps and illustrations). Paris: Berger-Levrault, 1895. Price, 3 francs.

Grands Artilleurs: Dronot—Senormont—Eblé. By CAPTAIN MAURICE GIROD DE L'AIN. Paris: Berger-Levrault. Price, 8 francs.

L'Armée et la Flotte en 1894. The Grand Manœuvres in the Beauce, the Fortress Manœuvres and the Naval Manœuvres. By ARDOUIN-DUMAZET (with maps and illustrations). Paris: Berger-Levrault, 1895. Price, 5 francs.



J. J. K. & Co., LONDON.

For Particulars, see Naval Notes, page 1,036.

The New Russian Armoured-Cruiser, "RURIK," 10,933 Tons, 13,250 I.H.P.